4.0 AFFECTED ENVIRONMENT

This Section provides a description of the physical, biological and socioeconomic environment that may be affected by implementation of the Proposed Action or the alternatives.

Under Section 4.1, Physical Environment, the EIS describes the setting for the following resources: geology and seismicity, cultural and historical resources, hydrology and water quality, air quality, noise, traffic, hazardous materials/waste, public services, and land use. In Section 4.2, Biological Environment, the EIS describes the habitats present, the covered species, other special-status species, and wildlife present in the affected area. In Section 4.3, Socioeconomic Environment, the EIS describes existing employment, housing and revenue sources. Sections 4.4 and 4.5 describe environmental justice and Indian trust assets.

4.1 PHYSICAL ENVIRONMENT

4.1.1 Geologic Hazards, Seismicity and Soils

4.1.1.1 Geologic Hazards and Regulations Governing Development in Hazard Zones

The primary geologic hazards within the study area include the potential for earthquake induced ground shaking, fault rupture, deformation, slope instability, liquefaction, and dam failure (Figure 4-1, Geologic Hazards).

Geologic Hazard Considerations for Building Permits. Stanford's Facilities Department maintains Facility Design Guidelines (FDG) which is a set of guideline design documents, technical specifications, and detail drawings to be used by architects, consultants and contractors in the design and construction of new and remodeled buildings and infrastructure on the Stanford campus. The FDG implement applicable local and state construction and building codes. The FDG are contained in Section 01030-G of the General Administrative Guidelines and are available on Stanford's website at http://facilities.stanford.edu/fdcs/.

At Stanford, work conducted within creeks is typically done using best management practices (BMPs) set forth under the Santa Clara Valley Water District (SCVWD) stream maintenance program. These BMPs cover timing of work, equipment, bank management techniques, vegetation removal, sedimentation and erosion controls, de-watering, etc. The primary purpose of the BMPS is to minimize impacts on the natural environment. The SCVWD BMPs are available on their website: www.valleywater.org.

Santa Clara and San Mateo counties, Woodside, Portola Valley, Palo Alto, and Menlo Park consider geologic hazards through their building permit process by requiring geotechnical reviews or reports for projects in hazard-prone areas. All new construction is required to conform to the most current Uniform Building Code (UBC) (International Conference of Building Officials, 1997 and California Amendments, 1998).

Santa Clara County Hazard Zone Maps. The County Geologist with the Santa Clara County Planning Office maintains geologic hazard maps that delineate known hazard areas. These hazard areas include the Alquist-Priolo Earthquake Fault Zones (known as Special Studies Zones prior to 1994) originally established by the state. Map zones for high risk geologic hazard areas indicate high susceptibility to land sliding, compressible soils, liquefaction, and fault rupture. Project plans are evaluated for susceptibility to these hazards as part of the permit review process.

Projects located within high hazard zones are required to have an engineering geologic report submitted to the County Geologist for review prior to project approvals. Requirements for mitigation of identified geologic hazards are incorporated into conditions of approval. At Stanford, the mapped zones include zones of land sliding and liquefaction. Landslide hazard zones in Management Zones 1, 2, and 3 were mapped near Matadero and Deer Creeks in the vicinity of Highway 280 and Page Mill Road. A landslide hazard zone north of JSB extending east and west of Page Mill Road in Management Zone 4 was also identified (Santa Clara County Geologic Hazard Zones maps, 2002). No compressible soil zones are shown on the Santa Clara County Geologic Hazard Zone maps as occurring on Stanford University lands.

San Mateo County Hazard Zone Maps. The San Mateo County Planning Department maintains geologic hazard maps that delineate known hazard areas. Hazard areas found on Stanford lands within San Mateo County include Alquist-Priolo Earthquake fault zones (Searsville area), areas of high landslide susceptibility (several pocket areas), potential liquefaction zones (along the San Andreas fault zone and San Francisquito and Los Trancos Creeks), debris flow areas (western portions of San Francisquito and Los Trancos Creeks), FEMA flood zones (around the Searsville area and along San Francisquito Creek), hazardous fire areas, and dam failure inundation areas (areas below Searsville, Felt, and Lagunita reservoirs). Since many of these hazards occur along the creeks, much of the lands within Management Zones 1 and 2 also contain these hazards. Project plans are evaluated for susceptibility to these hazards as part of the building permit review and approval process.

State of California Seismic Hazard Zones. The Palo Alto Quadrangle of the State of California Seismic Hazard Zones maps shows areas susceptible to liquefaction surrounding the San Francisquito, Matadero, and Deer Creek drainages located within Management Zones 1 and 2. Areas of liquefaction are also shown in Habitat Zone 4 under Highway 280 east of Alpine Road. Areas susceptible to earthquake induced landslides include upland areas of the San Francisquito, Matadero and Deer Creeks and lower elevations of Jasper Ridge. Potential landslide areas are also dispersed between Highway 280 and JSB in Management Zones 2 and 4.

4.1.1.2 Seismic Setting

Stanford University lands lie at the boundary of the San Francisco Bay alluvial plain and the foothills of the Santa Cruz Mountains, within the San Andreas Fault Zone. Three major active branches of this fault system, the San Andreas Fault, the Hayward Fault, and the Calaveras Fault, are located close enough to Stanford to produce strong seismic ground motion in the study area. Figure 4-2, Major Fault Zones, shows the location of the study area relative to the major faults. It has been estimated that there is a 62 percent chance of at least one magnitude 6.7 or greater earthquake striking somewhere in the San Francisco Bay Region before 2032 (Michael, et al. 2003).

At Stanford, the San Andreas Fault system has been mapped passing through the western-most portion of JRBP in the vicinity of Sausal Creek and Searsville Reservoir (Management Zones 2 and 3) (see Figure 4-3, Geologic Faults).

Other faults that can produce ground-shaking on Stanford lands include the San Gregorio Fault, the Monte Vista/Berrocal Fault, and the Calaveras or Hayward Fault Zones in the east bay. Faults that cross Stanford lands include Frenchman's Road Fault, Stanford Fault, San Juan Hill Fault, and the Basalt Quarry faults. These are not considered to be active because they have not shown seismic displacement within the last 2,000 years (GUP EIR, 2000). The Stock Farm Monocline, which is located in Management Zone 4, is highlighted on the Santa Clara County Geologic hazard map as an area capable of producing minor ground deformation in conjunction

with displacement along other faults in the area. Additional information on these faults can be found in the Stanford University General Use Permit Environmental Impact Report.

4.1.1.3 Soils

There are many soil types on Stanford lands. Most have low to moderate erodibility, but there are a few areas with highly erodible soils. Measures to reduce or prevent erosion are normally required of development under a local storm water pollution prevention program. Prime Farmland, Unique Farmland, Farmland of Statewide Importance, and Farmland of Local Importance are also designated on Stanford lands, and comprise about 200 acres (Figure 4-4, Farmland).

Federal actions that result in the irreversible conversion of Farmland (Prime, Unique, Farmland of Statewide or Local Importance) to non-agricultural use are subject to the Farmland Protection Policy Act (FPPA). The FPPA is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses, however, the FPPA does not authorize the Federal government to regulate the use of private or non-Federal land or, in any way, affect the property rights of owners. Farmland definitions are provided below:

Prime Farmland. Land designated as having the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. Prime Farmland must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

Unique Farmland. Unique Farmland is land which does not meet the criteria for Prime Farmland or Farmland of Statewide Importance and that is currently used for the production of specific high economic value crops (as listed in the last three years of California Agriculture produced by the California Department of Food and Agriculture). It has the special combination of soil quality, location, growing season and moisture supply needed to produce sustained high quality or high yields of a specific crop when treated and managed according to current farming methods. Examples of such crops may include oranges, olives, avocados, rice, grapes, and cut flowers. It does not include publicly owned lands for which there is an adopted policy preventing agriculture use.

Farmland of Local Importance. Land of importance to the local economy, as defined by each county's local farm advisory committee and adopted by its Board of Supervisors. Farmland of Local Importance is either currently producing, or has the capability of production, but does not meet the criteria of Prime Farmland, Farmland of Statewide Importance, or Unique Farmland.

Farmland of Statewide Importance. Farmland of Statewide Importance is land other than Prime Farmland which has a good combination of physical and chemical characteristics for the production of crops. It must have been used for the production of irrigated crops within the last three years. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

4.1.2 Cultural and Historical Resources

The affected environment for cultural and historic resources includes Stanford University and immediate environs. Cultural resources refer to pre-historic finds, including fossils and Native American resources. For these resources it is important to understand what finds have been

made in the immediate area, including on and off campus, because similar resources could be unearthed during activities related to the HCP. Historic resources include buildings, structures and sites. While there is a concentration of potential historic resources in the central campus area, there are also resources in the less developed lands currently under agricultural or open space uses. Many historic resources relate to the establishment of Stanford University or other local history.

The information provided in the discussion of the affected environment was derived from the Stanford Community Plan/General Use Permit EIR, Historic and Archaeological Resources. The information on the presence of cultural and historic resources within the HCP Management Zones was obtained from Laura Jones, Director of Heritage Services and University Archaeologist for Stanford University.

4.1.2.1 Historic Sites at Stanford

The Santa Clara County Historical Heritage Commission (HHC) oversees the protection of historical resources throughout the unincorporated areas of Santa Clara County. The Santa Clara County Heritage Resource Inventory (County Inventory) is the official listing of historic sites and is maintained by the Commission. San Mateo County does not maintain an inventory; potential historic and prehistoric sites are reviewed by the San Mateo County Planning Office.

The Santa Clara County Inventory consists entirely of sites that have been listed, or determined to be eligible for listing, on the National Register of Historic Places and/or the California Register of Historical Resources. As of May 2000, the Inventory included 21 resources located on Stanford lands within Santa Clara County. The 2000 GUP required Stanford to evaluate buildings more than 50 years old that would be affected by construction projects. Pursuant to the 2000 GUP and in compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties, Stanford has evaluated more than 70 sites and structures. Of the 70 structures and sites that were evaluated, 44 were found eligible for listing on the County Inventory. The Inventory does not provide a comprehensive or exhaustive inventory of historic resources at Stanford. Historic sites on campus are mainly located in Management Zone 4 (Figure 4-5, Historic Resources Inventory with Management Zones). There are a number of potential historic resources in Management Zones 1, 2 and 3 – farm houses, barns, bridges, Searsville Dam, Felt Dam and some historic archaeological sites as well.

Stanford has adopted a policy and procedures to protect archaeological resources, and maintains a professional staff position (University Archaeologist) to oversee the identification, classification, and preservation of archaeological and historical resources, and to communicate with the University Provost regarding archaeological explorations. The University Archaeologist also maintains collections and archives on the University's archaeological resources.

In summary, the University's policy is that "archaeological resources on Stanford lands are a vital part of the University's teaching and research programs, and the University is committed to their preservation" (Stanford 1988). Procedures are in place to assure that all routine ground disturbing activities are conducted in a manner that avoids impacts to known cultural resources. The policy and procedures apply to all Stanford lands that are adjacent or contiguous to the central campus. The procedures include the following:

1. Identify and describe prehistoric and historic archeological sites consistent with the Secretary of the Interior's Standards for Archeological Documentation to aid in project planning and design so that the project or activity can avoid known resources;

2. Evaluate the potential impacts of proposed construction projects on archeological resources, avoid impacts when possible, and bring conflicts to the Provost's attention for resolution;
3. Monitor construction projects. An Archeological Monitoring and Data Recovery Plan may be required in areas with the potential to contain buried deposits. The monitor may interrupt construction when warranted for up to 24 hours or to the extent mandated by State law if human remains are discovered. The Provost has the authority to stop construction projects permanently to protect significant archeological resources.

4.1.2.2 Archeology

All surface areas of Stanford University have been surveyed for archeological sites. As of October 2005, 65 prehistoric archeological sites (including isolates, lithic scatters, millingstone/petroglyphs, and occupation sites) have been identified and mapped. Sites are re-surveyed periodically to monitor their condition (personal communications with Laura Jones, Stanford University Archaeologist, January–April 2007). A comprehensive inventory of these sites is maintained by the University Archaeologist. Site records are also on file with the Northwest Information Center of the California Historical Resources Inventory at Sonoma State University. Roughly 50 of the 65 prehistoric sites are situated along the creek corridors in Zone 1 and many extend into the expanded creek buffers of Zone 2. The sites are mostly Ohlone Indian "occupation sites and cemeteries." There also are a few "bedrock features" located in these Zones.

4.1.2.3 Paleontology

Most of the paleontological remains in the Stanford area are small marine fossils such as clams and snails. Stanford lands also contain old quarries, creek beds, cut slopes and rock outcroppings which are of geological interest and educational value. The best exposed rock formations are along Arastradero Road.

The Berkeley Museum has recorded four paleontological sites on or near Stanford lands (EIP 1989:15-7). The most important of these is a site near the SLAC National Accelerator Laboratory where a *Paleoparadoxia* (an extinct marine mammal of the order Desmostylia) was uncovered during excavation. It is the best-preserved and most complete *Paleoparadoxia* skeleton found outside of China. The other three sites contained bones of a seal-like mammal called *Allodesmus* and the remains of other marine mammals. In addition, a feature containing fossilized remains of terrestrial fauna from a much later period (Pleistocene) was encountered in a deep excavation near the Stanford Medical Center (personal communications with Laura Jones, Stanford University Archaeologist, January–April 2007).

The United States Geological Survey (USGS) recorded three additional fossil discoveries on or near Stanford. These include a large mastodon tusk found in the bank of San Francisquito Creek, and fragments of petrified mastodon and/or dinosaur bone near JSB and along Foothill Expressway. Isolated fragments of fossil ribs and lower limbs from late Pleistocene mammals have also been discovered in various locations and have been collected and catalogued by Stanford.

4.1.3 Hydrology and Water Quality

The existing surface drainage, water diversions, groundwater hydrology and water quality are described here. The affected environment is limited to Stanford lands except where noted. Water supply is addressed under Public Services.

4.1.3.1 Existing Conditions

Watersheds. Most of Stanford's lands (5,960 acres out of 8,180 acres) are located within the San Francisquito Creek watershed (Figure 2-2). The main drainages in this area include San Francisquito and Los Trancos creeks. Stanford's lands also include approximately 1 mile of the lowermost reach of Corte Madera Creek (includes Searsville Reservoir) and approximately 0.25 mile of lower Bear Creek. The 0.3 mile reach of Corte Madera Creek located immediately downstream of Searsville Dam is sometimes referred to as "Upper San Francisquito Creek." Corte Madera Creek and Bear Creek join together to form San Francisquito Creek. Other surface water features on Stanford lands within the San Francisquito Creek watershed are Felt Reservoir, Searsville Reservoir, and Lagunita.

San Francisquito and Los Trancos creeks flow in a northerly or northeasterly direction from the Santa Cruz Mountains to San Francisco Bay. San Francisquito Creek forms the boundary between San Mateo and Santa Clara counties. There are several off-site tributaries that drain into the San Francisquito Creek watershed including West Union Creek and Dry Creek that flow into Bear Creek; McGarvey Gulch Creek and Squealer Gulch Creek that flow into West Union Creek, and Bear Gulch Creek which flows into Bear Creek.

Roughly 2,100 acres of Stanford University lands are located within the Matadero Creek watershed. The primary drainage is Matadero Creek, which flows in a northeasterly direction through Stanford University and Palo Alto to San Francisco Bay. Deer Creek and Arastradero Creek are tributary to Matadero Creek. The downstream portion of Matadero Creek is channelized in Palo Alto.

In addition, the remaining small portions of Stanford are within the Barron Creek watershed and the Atherton Creek watershed. Barron Creek flows through the Stanford Research Park on the extreme eastern portion of Stanford lands. Atherton Creek flows near the Highway 280/Sand Hill Road interchange. All watersheds drain to the San Francisco Bay.

The approximate watershed boundaries within the study area are shown in Figure 2-2. Note that the creeks included in the hydrology discussion are just those tributaries that are on the Stanford lands. There are off-site tributaries that flow into the primary creeks as well.

Generally, Stanford's lands slope in a northerly direction with elevations ranging from approximately 690 feet on the southwest portion in JRBP, to approximately 40 feet on the north near El Camino Real.

4.1.3.2 Groundwater

Stanford is underlain by both an unconfined zone (where groundwater recharge can occur) and a confined zone (where recharge cannot occur). The confined zone contains a naturally occurring impermeable layer preventing water movement from the ground surface to the aquifer. The unconfined zone at Stanford is relatively small, consisting of a swath of land between the main quad and JSB, stretching west to Sand Hill Road and east to Stanford Avenue. The eastern portion of the unconfined zone south of the main quad is within Management Zone 4. The western portion of the unconfined zone includes Lagunita and the golf course in Management Zones 1, 2, 3, and 4. The remainder of Stanford land is within the confined zone.

The bed of Lagunita is very permeable, with loss rates estimated at 500 gallons per minute to percolation. Metzger (2002) reports water infiltration at Lagunita contributes to both shallow and deep water aquifers. Water from San Francisquito Creek is seasonally pumped by Stanford via the San Francisquito Creek Pump Station into Lagunita where this volume is conveyed to

groundwater minus evapotranspiration. To mitigate the effects to groundwater recharge associated with future campus development, the County of Santa Clara required Stanford to complete a study which estimates recharge "lost" to new development and a means to "offset" these losses (2000 GUP Condition of Approval N.4). Stanford's 2005 "Proposed Campus-wide Plan for Groundwater Recharge" mitigates the effects of new impervious surfaces on groundwater recharge through the conveyance of a quantifiable amount of water from Stanford's irrigation water supply to Lagunita. Stanford currently tracks calculated levels of groundwater recharge lost to new development, and mitigation through percolation in Lagunita occurs per the 2005 Proposed Campus-wide Plan for Groundwater Recharge. San Francisquito Creek is also a significant source of groundwater recharge. The majority of groundwater recharge from San Francisquito Creek (about 90 percent) occurs between the USGS gage at the Stanford Golf Course and the Palo Alto Municipal Golf Course (Metzger 2002).

4.1.3.3 Hydrology and Flooding

Climate and Precipitation. Stanford lands are an area with a Mediterranean climate. Over 90 percent of annual precipitation occurs between November and April. Coastal fog generally alternates with clear, warm weather during the months of May through September. Stream flow in the watershed is variable due to its dependence on rainfall. Average annual precipitation maps show that Stanford land receives between 15 and 20 inches of rain per year (Western Regional Climate Center 2006). Precipitation is higher in the upper watershed areas. Mean annual precipitation at the crest of the Santa Cruz Mountains is about 40 inches per year (Rantz 1971 as cited in Balance Hydrologics, Inc. 1996). Air temperatures at Stanford range from lows of about 40˚ F in December and January to highs around 80˚ F between June and October.

Surface Water Features. San Francsiquito Creek and its tributaries drain a basin encompassing 45 square miles, including 37.4 square miles of hilly mountainous terrain upstream of the USGS gage (RM 8), and approximately 7.5 square miles of gently sloping, mostly urbanized plain extending downstream of the USGS gage (USGS #1164500) to San Francisco Bay. There are 14.6 square miles of the watershed located upstream of Searsville Reservoir, which drains the eastern slopes of the Santa Cruz mountains between Kings Mountain and Russian Ridge (Balance Hydrologics, Inc. 1996). The four principal creeks draining into Searsville Reservoir are Corte Madera Creek, Dennis Martin Creek, Sausal Creek, and Alambique Creek.

The San Francisquito Creek watershed consists of San Francisquito Creek and its three main tributaries: Corte Madera Creek, Los Trancos Creek, and Bear Creek. San Francisquito Creek flows about 12 miles from the confluence of Corte Madera and Bear creeks to San Francisco Bay. Los Trancos Creek is about an eight mile long stream with a roughly 7.6-square-mile watershed, and enters San Francisquito Creek approximately 3.5 miles downstream from the confluence of Corte Madera and Bear creeks. Bear Creek drains and area of approximately 13 square miles and is formed by two major tributaries, Bear Gulch and West Union Creek.

The Matadero Creek watershed drains about 14 square miles, including approximately 11 square miles of hilly mountainous terrain, and 3 square miles are gently sloping valley floor. Matadero Creek originates in the foothills of the Santa Cruz Mountains and flows in a northeasterly direction for approximately eight miles until it discharges into the Palo Alto Flood Basin, and then drains into the South San Francisco Bay. Major tributaries to Matadero Creek are Arastradero and Deer Creeks.

The watershed includes a mix of open space preserve, low-density residential housing, and undeveloped private property in the upland areas. The downstream areas of the watershed have been highly modified and mainly consist of commercial and high density development.

Matadero Creek has a much smaller annual stream flow than San Francisquito Creek, but the watershed supports many of the same animal and plant species as San Francisquito Creek watershed (Launer and Holtgrive 2000). However, steelhead do not occur in the Matadero Creek watershed.

Hydrologic Regime. Flows within the San Francisquito Creek watershed are highly variable and can go quickly from low base flow conditions to high flows and then quickly recede again. Flows in San Francisquito Creek range from several hundred cubic feet per second during and immediately following winter storm events, to less than 1 cubic foot per second during most summers. Portions of the watershed, including Los Trancos Creek, can run dry in late summer and in fall.

The USGS operates a stream gage on San Francisquito Creek at the Stanford Golf Course upstream of JSB (USGS #1164500). This gage provides the best long-term record of stream flow in the watershed with flow records extending from 1931 to 1941 and then from 1951 to present. Warm, dry summers typically create low flow or dry conditions in the streams on Stanford lands, while the mild, wet winters result in flows ranging from moderate levels to flood events. Figure 4-6 presents the median (50 percent exceedence level) monthly flow in San Francisquito Creek at the USGS gage for approximately 70 years of record as well as the 80 percent exceedence level to represent wet water years and the 20 percent exceedence level to represent dry water years. The bed of San Francisquito Creek becomes highly permeable downstream of the USGS gage and much of the streambed in this reach can go dry for about six months of the year (Metzger 2002).

Because changes in runoff and flow pattern from development can result in downstream flooding, the affected environment for flooding is extended to include downstream areas that drain runoff from Stanford's land to San Francisco Bay.

Historically, both San Francisquito Creek and Matadero Creek have flooded. Even without significant development, San Francisquito Creek overtopped its banks eight times between 1910 and 1972 (Northwest Hydraulic Consultants 2004). The most recent flood occurred in 1998 with a peak of 7,200 cubic feet per second at the Stanford University gage and resulted in significant flooding downstream of Middlefield Road (Jones & Stokes 2006). Over 1,700 residential and commercial buildings were affected and caused more than $26.6 million in property damages (Federal Register, 2006b).

While the floods are usually in the downstream reaches, San Francisquito Creek did flood once near Alpine Road in 1982. Currently, the reaches of San Francisquito Creek between El Camino Real and San Francisco Bay are designated as flood zones that can overflow during the 100-year flood (SCVWD 2006).

Santa Clara County approved a Storm Water Detention Plan which was developed by Stanford for the Matadero Creek watershed. Stanford is responsible for implementing phased measures consistent with the plan prior to development of new impervious cover within the Matadero Creek watershed (Santa Clara County 2006). Stanford constructed storm water detention basins near El Camino Real and Serra Street in 2001 to detain peak flows in Matadero Creek.

Stanford and Santa Clara County reached an agreement on the approach and engineering design criteria for detention provisions to avoid increases in peak runoff flow rate from Stanford in the San Francisquito Creek watershed. As a condition of GUP approval, Stanford was required to implement a storm drainage master plan, and to date Stanford has offset anticipated runoff from a substantial portion of its future development under the 2000 GUP in compliance with

Conditions of Approval N.2 and N.3 (Santa Clara County, 2006) through construction of storm water detention basins in 2003.

Future development beyond what has been approved by the GUP is required to comply with the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) and San Mateo Countywide Water Pollution Prevention Program (SMCWPPP). Municipalities in these programs share common NPDES permits in order to discharge storm water into San Francisco Bay. Developments in the jurisdiction of either program are subject to provision C.3 of the NPDES permit. Provision C.3 applies to new development or redevelopment creating or replacing over 10,000 square feet of impervious surface. The provision requires projects to incorporate site design, source control measures, and storm water treatment Best Management Practices into the project design. Projects subject to SCVURPPP or SMCWPPP that disturb 1 or more acres could also be subject to Hydromodification Management Plan[6] requirements to ensure post-project runoff does not exceed pre-project rates and durations.

4.1.3.4 Water Quality

Surface Water. A surface-water monitoring program sponsored by Stanford University and the City of Palo Alto was initiated in 2001 as part of the Long-Term Monitoring and Assessment Program (LTMAP) for San Mateo and Santa Clara counties. Since the fall of 2001, Balance Hydrologics, Inc. has operated two automated water quality sampling stations on San Francisquito Creek and Los Trancos Creek at Piers Lane, just above their confluence. In the fall of 2003, Kinnetic Labs (Santa Cruz) installed another automated sampling station, located on Bear Creek at Sand Hill Road, along the northern border of the JRBP. This Bear Creek station is now operated by Balance Hydrologics, Inc. and is configured similarly to the other stations. Monitoring at these stations includes water temperature, specific conductance, pH, dissolved oxygen, sediment, and stream flow. Due to budget constraints, not all parameters are monitored at all three stations every year.

During the period between November 1 and March 31, water temperatures at all three stations typically range between 41 and 59˚ F. During the period between April 1 and May 31, water temperatures gradually rise and typically range between 50 and 59˚ F. During the dry season, between June 1 and October 31, water temperatures typically range between 59 and 68˚ F with slightly warmer temperatures in San Francisquito Creek. Dry season water temperatures in Bear Creek and Los Trancos Creek are very similar, and both are cooler than San Francisquito Creek (Balance Hydrologics, Inc 2010). Information on water temperatures in Corte Madera Creek downstream of Searsville Dam was collected periodically between 1995 and 2002 by JRBP staff and docents (Stanford University 2010). These data show that water temperatures in lower Corte Madera Creek are similar to that of San Francisquito Creek at Piers Lane.

Dissolved oxygen (DO) concentrations in all creeks show typical seasonal variation in which DO decreases during summer and fall months when water temperatures are highest and stream flows are low (Balance Hydrologics, Inc. 2008). DO levels at the three water quality monitoring stations described above typically range from 10 to 14 milligrams per liter during the winter months. These DO levels are not limiting for aquatic biota and are likely high due to periodic

[6] Hydromodification is the alteration of the natural flow of water through a landscape, often caused by increased runoff from impervious surfaces. A hydromodification management plan delineates areas where increases in runoff are most likely to impact channel health and water quality and provides management options for maintaining pre-project runoff patterns. See http://www.scvurppp-w2k.com/pdfs/0506/hmp_factsheet.pdf

high flow events and cold ambient water temperatures during the winter period (Balance Hydrologics, Inc. 2010). DO concentrations during the summer and fall months typically range from 5 to 10 milligrams per liter. The lowest concentrations tend to occur in the fall months when rotting leaves accumulate in the stream and prior to the start of seasonal rainfall. These lowest levels of DO during the fall may occasionally be limiting to aquatic biota. San Francisqutio Creek experiences slightly lower DO levels than Bear Creek and Los Trancos Creek (Balance Hydrologics, Inc. 2011).

Suspended sediment concentrations as well as concentrations of other constituents have been monitored as part of the LTMAP. Suspended-sediment rating curves for San Francisquito, Los Trancos, and Bear creeks have been developed and all three curves show a strong dependence on flow; when flow is higher, the creeks carry more sediment (Balance Hydrologics Inc. 2005-2010). Bear Creek and Los Trancos Creek generally carry higher suspended-sediment loads at a given flow than San Francisquito Creek (Balance Hydrologics, Inc. 2005-2010). However, higher rates of transport in tributary streams are a typical condition and nearly universal throughout the Bay Area, since tributary watersheds tend to be steeper and more subject to erosion due to higher flow velocities (Balance Hydrologics, Inc. 2010). In addition, suspended-sediment concentrations in San Francisquito Creek are diluted by outflows from Searsville Reservoir, which traps a large proportion of the sediment load from tributary streams higher in the watershed (Balance Hydrologics, Inc. 2009). Monitoring for ammonia, lead, silver, aluminum, copper, mercury, pesticides, and polycyclic aromatic hydrocarbons (PAHs) has also been performed in the watershed for the LTMAP. Concentrations of dissolved constituents were below levels of regulatory concern, and suspended-sediment estimates and qualitative observations indicate that conditions were typical of creeks in the San Francisquito Creek watershed. Levels of these constituents tended to be highest during the first or second storm of the season, and lowest in samples collected during the dry season. Nitrate-nitrogen concentrations showed a general pattern in which they were highest during first-flush events early in the wet season; however, the observed nitrate-nitrogen concentrations in all three creeks were within the expected range for streams draining developed areas of the Santa Cruz Mountains. Sources of nitrogen in the watershed include horse stables, fertilizers, yard waste, and failing septic systems (Balance Hydrologics, Inc. 2008).

Storm water quality was analyzed in the Stanford GUP EIR. Samples taken from 1993 to 1999 showed pollutant concentrations that were typical for urban areas. However, San Francisquito Creek and Matadero Creek are on the 2006 CWA Section 303(d) list of water quality limited segments (State of California Water Resources Control Board 2006). San Francisquito Creek is listed as polluted by diazinon and sedimentation/siltation. The potential sources of contamination for diazinon were identified as urban runoff/storm sewers and the source for sedimentation/siltation was identified as nonpoint source. Matadero Creek is also on the list as impaired by diazinon from urban runoff/sewers. Los Trancos and Deer creeks are not listed on any CWA 303(d) lists.

In addition to minimizing hydromodification, the NPDES permits for the SCVURPPP and SMCWPPP aim to reduce pollution in urban runoff to the maximum extent practicable by using regulatory, monitoring and outreach measures to improve surface water quality.

Groundwater Quality. The analysis of three wells studied for the GUP EIR found that groundwater at Stanford is potable. The constituent concentrations were in compliance with primary domestic water quality standards (safe to drink) for nitrate and the secondary domestic water quality drinking water (consumer acceptance limits) for the other nine constituents typically measured.

Water Quality Protections. Stanford lands include agricultural and equestrian leaseholds that have the potential to impact surface water quality. Stanford requires the lessees to adhere to Best Management Practices (BMPs) for management of animal waste, compost and sediment in order to protect creek water quality. The BMPs address animal washing; horse boarding, pasturing and training; stockpiling of animal waste, compost or nursery-container materials; disposing of animal waste; land application of manure and compost; maintaining unpaved roads adjacent to creeks; and other sediment-producing activities adjacent to creeks.

At the Stanford Golf Course, integrated pest management is used for golf course maintenance. Pesticides for weed and insect control are used as a last resort and in accordance with all state and local pest control regulations. Spot treatment is used rather than broadcast methods, a naturalized buffer is maintained along the creek, and the "roughs" have been naturalized to provide understory vegetation for wildlife. Fertilizers are not applied during the rainy season because they could be transferred away from the golf course in storm water. When grading is necessary, standard BMPs are implemented to protect water quality.

In addition to the BMPs, lessees in Portola Valley and Woodside must comply with ordinances pertaining to stables. Limitations on construction near creeks are also imposed by Portola Valley, Santa Clara County, and San Mateo County. These controls are in place in order to protect the riparian habitats and water quality. Local creek protection policies that also protect water quality are listed in Table 4-1.

Bank Stabilization and Erosion. The areas on Stanford's lands that are most prone to erosion are located along the creeks. Stanford conducts both routine and emergency creek maintenance work in and around all of the creeks on its property (including Deer, Matadero, Los Trancos, San Francisquito, Corte Madera, Bear, and Sausal). Routine maintenance consists of debris removal, including compliance with requests from the Santa Clara Valley Water District to remove downed trees and other debris from the creeks. This work is typically conducted during periods of low flow, but if an emergency arises, work in the creek can occur at any time of the year. Tree snags and other debris are removed only if they are disrupting the free flow of water or are causing undo erosion.

Bank stabilization regularly occurs in the more urbanized areas of campus, such as areas near the Oak Creek Apartments and the Children's Health Council along San Francisquito Creek, near the Ladera Tennis Club along Los Trancos Creek, and near the Stanford Research Park along Matadero Creek. Recent bank stabilization efforts at Stanford have involved sinking pillars into the existing bank, with little structural work done on the surface. In a number of locations, however, gabions, riprap, and concrete aprons are present. These older types of bank stabilization methods have a tendency to fail, and future repair work is therefore anticipated as a Covered Activity in the HCP.

Table 4-1. Creek Protection Policies

Municipality	Policy	Description
Santa Clara Valley Water District	Section 6 of Ordinance 83-2	A permit is required for all construction or grading within 50 feet of the top of bank for all creeks, channels and floodways within the District's boundaries.
Santa Clara County General Plan	C-GD 6	Riparian corridors are considered unsuitable for urban development.
	R-RC 31	Natural streams, riparian areas, and freshwater marshes shall be left in their natural state providing for percolation and water quality, fisheries,

Table 4-1. Creek Protection Policies

Municipality	Policy	Description
		wildlife habitat, aesthetic relief, and educational or recreational uses that are environmentally compatible. Streams which may still provide spawning areas for anadromous fish species should be protected from pollution and development impacts which would degrade the quality of the stream environment.
	R-RC 32	Riparian and freshwater habitat shall be protected by setback of development, regulation of tree and vegetation removal, reducing/eliminating use of pesticides and herbicides and fertilizers.
	R-RC 37	Lands near creeks streams and freshwater marshes shall be considered to be in a protected buffer area, consisting of the following: 1) 150 feet from top of bank in natural areas 2) 100 feet from top of bank in altered/developed areas 3) If (1) and (2) are not applicable, an area sufficient enough to protect the stream from adverse impacts of adjacent development
Stanford University Community Plan	SCP-LU 30	The Special Conservation Areas designation applies to lands south of JSB…deemed unsuitable for development due to natural resource constraints… it may include…Riparian areas extending 150 feet from the top of creek banks.
	SCP –LU 31	The use of Special Conservation Areas is limited to conservation activities and habitat management, field environmental studies, and appropriate agricultural uses. Recreational use may be allowed if it is consistent with the particular environmental constraints of an area.
	SCP-LU 32	No new permanent development in the form of buildings or structures is allowed [in Special Conservation Areas], other than construction, modification, and maintenance of improvements to support conservation efforts…
	SCP-OS 3	Identify and delineate Special Conservation areas where no development would be permitted (see SCP-LU 30).
	SCP-OS (i) 2	Require easements as appropriate in Special Conservation areas. Locate easements in areas which serve critical habitat needs.
	SCP-RC 7	Maintain and restore riparian buffer zones along creeks as described in Santa Clara County General Plan policy R-RC 37.
	SCP-RC 17	Avoid development in riparian areas and wetlands.
San Mateo County Zoning Ordinance	6912.2	(k) With the exception of trails and paths, and related appurtenances, no structural development shall be permitted where such development will adversely affect a perennial stream and associated riparian habitat.
	6912.4	(f) Development, with the exception of agricultural uses and public works and public safety projects, which might cause significant adverse impacts upon the natural course or riparian habitat of any stream, shall not be permitted. All developments shall be required to perform all feasible measures to mitigate possible impacts upon such areas.
City of Menlo Park (no specific ordinances for	7.42.130 Watercourse protection	Every person owning property through which a watercourse passes, or such person's lessee or tenant, shall keep and maintain that part of the watercourse within the property reasonably free of trash, debris, excessive vegetation, and other obstacles which would pollute, contaminate, or significantly retard the flow of water through the

Table 4-1. Creek Protection Policies

Municipality	Policy	Description
creek setbacks)		watercourse; shall maintain existing privately owned structures within a watercourse so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse; and shall not remove healthy bank vegetation beyond that is actually necessary for said maintenance, nor remove said vegetation in such a manner as to increase the vulnerability of the watercourse to erosion. (Ord. 859 (part), 1994).
	15.16.130 Watercourses	Watercourses shall be shown as easements, and storm drains shall be placed in easements when public right-of-way is not available or adequate. The planning commission or city engineer may require watercourses to be placed entirely in underground conduits or adequately fenced or otherwise improved. If any watercourse alteration is to be made in the designated flood hazard area, the city engineer will notify the California State Department of Water Resources, and the Federal Insurance Administrator. (Ord. 658 § 2(b), 1980; Ord. 615 § 1 (part), 1977: Prior code § 24.7 (1)).
City of Palo Alto	16.28.060 of the Municipal Code	A permit is required to grade, fill, excavate, store, or dispose of soil and earth materials or perform any other land-disturbing or land-filling activity when the activity takes place within 100 feet by horizontal measurement from the top of the bank of a watercourse, the mean high watermark (line of vegetation) of a body of water or the boundary of the wetlands associated with a watercourse or water body, whichever distance is greater. (Ord. 4564 § 1 (part), 1999)
	Streamside Open Space Land Use designation (Comprehensive Plan)	The corridor of riparian vegetation along a natural stream. Development limited to hiking, biking, riding trails. The corridor generally varies in width up to 200 feet on either side of the center of the creek, except along San Francisquito Creek where the open space corridor varies between 80 to 310 feet from the center line of the creek.
	Program N-7 of Policy N-11: Preserve the integrity of riparian corridors (Palo Alto Comprehensive Plan)	Adopt a setback along natural creeks that prohibits the siting of buildings and other structures, impervious surfaces, outdoor activity areas, and ornamental landscaped areas within 100 feet of the top of a creek bank. Allow passive or intermittent outdoor activities and pedestrian, equestrian, and bicycle pathways where there are adequate setbacks to protect the natural riparian habitat. Within the setback area, provide a border of native riparian vegetation at least 25 feet along the creek bank. Exceptions: 1) Single family properties are exempt except that undeveloped parcels southwest of Highway 280 are not exempt. A creek ordinance and guidelines will be prepared addressing appropriate setbacks and creek conservation measures. 2) Existing development within the 100-foot setback will be considered legal and nonconforming. With the 100-foot setback as a goal where feasible, redevelopment of such sites must be consistent with basic creek habitat objectives and make a significant net improvement in the condition of the creek.

4.1.3.5 Water Diversions and Searsville Dam

Dams and diversion structures operated by Stanford over the past century have affected flow regimes in San Francisquito Creek, Los Trancos Creek, and lower Corte Madera Creek. Natural stream flow patterns in these creeks are altered by: 1) winter and spring water diversions from Los Trancos Creek at the Los Trancos Creek Diversion Facility; 2) winter and spring water diversions from San Francisquito Creek at the San Francisquito Creek Pump Station; and 3) year-round water storage and diversion on lower Corte Madera Creek at Searsville Dam (Searsville Diversion).

Stanford University has diverted water from Los Trancos Creek and from San Francisquito Creek since the early 1900s. Spring Valley Water Company initiated water diversions at Searsville Reservoir in the late 1800s and diversions have continued since Stanford's acquisition of the facility in the early 1900s. The diverted water is used primarily for irrigation of the Stanford golf course, athletic fields, and campus landscaping, as well as for environmental, recreational, aesthetic and groundwater recharge purposes. In an emergency, this water could be used for fire fighting and supply domestic and municipal water to the campus and surrounding communities.

Stanford diverts creek flow up to 40 cubic feet per second from Los Trancos Creek (the capacity of the flume). At river mile 2.4 on Los Trancos Creek, Stanford's water diversion facility consists of a dam, radial gate, fish screen, fish ladder, and flume. The water is diverted to Felt Reservoir for storage. Existing pipelines and canals allow water from the Los Trancos Creek Diversion Facility to be conveyed to Felt Reservoir, Lagunita, and to Stanford's campus irrigation system. In 2009, Stanford implemented the SHEP which included upgrading the Los Trancos Creek Diversion Facility with a new fish screen and fish ladder. Concurrent with the completion of the SHEP upgrade, Stanford adopted new operational criteria which include higher bypass flows for Los Trancos Creek downstream of the water intake. During December, the Los Trancos diversion bypasses at least 2 cubic feet per second whenever the facility is in operation unless an 8 cubic feet per second "trigger" event has occurred and the minimum bypass flow requirement is 5 cubic feet per second. Between January 1 and April 30, the facility bypasses at least 5 cubic feet per second whenever the diversion is operating. If the mean daily flow of Los Trancos Creek is 8 cubic feet per second or greater, the bypass requirement is 8 cubic feet per second. Between May 1 and November 30, the facility does not divert water from Los Trancos Creek. The operational criteria for the Los Trancos Creek water diversion under all stream flow regimes are presented in Table 3-2.

On San Francisquito Creek, Stanford operates the San Francisquito Creek Pump Station, which consists of two sets of pumps. One set of pumps diverts water from San Francisquito Creek to Lagunita, at a maximum rate of 4 cubic feet per second. The other set of pumps includes a 2 cubic feet per second pump and a new variable capacity pump with a maximum diversion rate of 6 cubic feet per second to divert water to Felt Reservoir and the campus irrigation system. The new 6 cubic feet per second pump at the San Francisquito Pump Station was installed in 2009 as part of the SHEP. The facility was also equipped with a new surface intake system and fish screen in 2009. As with the Los Trancos diversion, the San Francisquito Pump Station adopted new operational criteria with the facility upgrades. Bypass flows for fish downstream are designed to ensure 5 cubic feet per second of flow is bypassed whenever the facility is in operation. If the flow of San Francisquito Creek exceeds 16 cubic feet per second, pumping operations will be modified to ensure bypass flows of at least 16 cubic feet per second are maintained downstream. Although the facility has a maximum pumping capacity of 12 cubic feet per second, Stanford's operational criteria limits the maximum instantaneous rate of

diversion at the San Francisquito Creek Pump Station (whether to the Felt Lake/campus distribution system, to Lagunita, or to both systems simultaneously) to not exceed 8 cubic feet per second. From July 1 to November 30, no water is diverted at the pump station. The operational criteria for the San Francisquito Creek Pump Station under all stream flow regimes are presented in Table 3-3.

The listing of steelhead as a threatened species in 1997 prompted the CDFG and NMFS to request modification of the Los Trancos Creek Diversion Facility to further reduce impacts to steelhead. Stanford responded by developing the SHEP described above for the Los Trancos Creek Diversion Facility as well as at the San Francisquito Creek Pump Station. The SHEP provides for improved bypass flows to protect the stream and aquatic habitat downstream of the water diversion facilities. The SHEP minimum bypass requirements were incorporated into the permits for construction of the modified diversion facilities from the USACE pursuant to the CWA and from the CDFG pursuant to Section 1602 of the Fish and Game Code. The biological opinion issued by the NMFS for the SHEP is provided in Appendix A of the HCP (Appendix B of the EIS).

On lower Corte Madera Creek, Stanford owns and operates the Searsville Dam, Reservoir and Diversion. The Searsville Diversion draws water from Searsville Reservoir through three inlets located 1, 8, and 16 feet below the dam's spillway. The exact configuration of the inlet structure is uncertain (Freyberg and Cohen 2001). The inlets connect to two 16-inch cast iron pipelines and these two outlet pipelines extend through the dam near its base. Each 16-inch pipeline is equipped with a slide gate at the dam's upstream face. Below the dam, one outlet pipe extends approximately 50 feet downstream to a site on the bank of lower Corte Madera Creek and is equipped with a gate or blow-off valve for pipeline maintenance. This gate valve may also be used to release water from Searsville Reservoir to lower Corte Madera Creek. The second 16-inch pipeline extends downstream to the main campus where it connects to other pipelines in Stanford's water system. The Searsville Diversion is the smallest of Stanford's three water intakes. The capacity is limited by the diameter (16 inches) of the pipeline and estimated to be about 3 cubic feet per second. Due to its location in Searsville Reservoir on lower Corte Madera Creek, it may divert water year-round if there is adequate water storage in the reservoir.

Construction of Searsville Dam was completed in 1892 by Spring Valley Water Company to supply San Francisco's growing water demand. In 1919 Searsville Dam and some surrounding property became part of the newly constructed Leland Stanford Junior University. The dam and surrounding property has remained in the possession of Stanford ever since (Freyberg and Cohen 2001). The reservoir is now located within Stanford's 1,189 acre JRBP. In 1973 the Stanford Board of Trustees formally designated Jasper Ridge as a biological preserve. Public access and recreational activities were terminated at Searsville Reservoir in 1975.

The location of Searsville Dam was chosen because of the high canyon walls that confine lower Corte Madera Creek. The reservoir site is relatively flat and speculated to have been a historical wetland. The dam was built by stacking large concrete blocks on top of each other with no mortar. Being stacked in this manner allows the dam to absorb an earthquake. The current height of the dam above its upstream base is 67.5 feet and its crest length is 275 feet. The dam crest was raised 5.87 feet and the spillway redesigned by Stanford shortly after it took ownership in 1919. The spillway can be equipped with flashboards to increase the holding capacity of the reservoir. When in use these flashboards, installed in all five of the dam's spillway bays, temporarily raise the crest elevation by 4.4 feet, giving a total maximum height of 71.9 feet (Freyberg and Cohen 2001).

Throughout its history, the depth and volume of Searsville Reservoir has changed dramatically due to high levels of sedimentation. In 1892, after construction of the dam was completed, Searsville Reservoir's capacity was 1,055 acre-feet (Balance Hydrologics, Inc. 1996). In 1920, the dam's spillway was raised by about 6 feet which increased the reservoir's capacity to 1,365 acre-feet (Balance Hydrologics, Inc. 1996). Due to sedimentation, the volume of the reservoir was roughly 192 acre-feet in 2000 (Rebecca Young as cited in Freyberg and Cohen 2001). This is approximately 14 percent of its water storage capacity. A more recent report (Wang et al. 2006) describes the historical capacity of the reservoir to be 1,500 acre-feet in 1892 and current capacity to be 150 acre-feet in 2006. The Searsville Reservoir basin is now delineated as three reservoir areas; lower, middle and upper reservoirs. The "lower reservoir" includes the current open water area of Searsville Reservoir and extends approximately 0.33 mile immediately upstream of Searsville Dam. The "middle reservoir" is 0.25 mile upstream and to the northwest of the existing open water portion of Searsville Reservoir, and includes the lowermost reach of Dennis Martin Creek. The existing storage capacity of middle reservoir is unknown and the area is currently dominated by cattails. The "upper reservoir" is located further to the northwest of the middle reservoir and it is the smallest of the three existing reservoir areas. The upper reservoir is connected to middle reservoir by two 48-inch circular concrete culverts that run under Portola Road. The upper reservoir is located on the San Andreas Fault and fed by Alambique Creek. The lower, middle and upper reservoirs were historically much larger in water volume and together comprised the original 1890s Searsville Reservoir. Decades of sediment accumulation has increased the separation distance of the three reservoir areas drastically.

Due to the current small storage capacity, Searsville Dam and Reservoir do not have the typical effects on the downstream environment as one would expect from larger reservoirs (i.e., reducing flooding, significantly altering flow regimes, and the desynchronization of tributary and mainstem flows) (Northwest Hydraulic Consultants 2004). At its 1981 capacity, Searsville Reservoir was estimated to dampen peak flood rates by 10 percent (Balance Hydrologics, Inc. 1996) and reduce 2-year flood flows by 2 percent (Northwest Hydraulic Consultants 2004). Thus, the facility offers no real flood protection to areas below the dam, but does have some effect on the timing of the storm surge passing downstream.

Stanford's water intake and diversion of water stored in Searsville Reservoir influences stream flows in lower Corte Madera Creek below the dam. Due to its small diversion capacity and location upstream of the confluence with Bear Creek, operation of the Searsville Diversion has a relatively minor effect on stream flows in San Francisquito Creek. Effects of this diversion are primarily limited to the 0.3 mile reach of lower Corte Madera Creek immediately downstream of Searsville Dam and these effects vary significantly by season. During the winter wet season, the dam and water diversion at Searsville has little impact on flows in lower Corte Madera Creek because the current holding capacity of the reservoir is less than 200 acre-feet. A moderate storm event producing 0.5 inch of runoff in the upstream watershed of Corte Madera Creek will produce about 380 acre-feet of runoff. Thus, a single moderate precipitation event is enough to fill the existing capacity of Searsville Reservoir and initiate spill over the dam's crest to lower Corte Madera Creek. There will be a short lag period while the reservoir fills, but after Searsville Reservoir has reached capacity, the flow in lower Corte Madera Creek closely matches the rate of inflow to the reservoir during the winter and early spring months.

During the period between mid-April and mid-June of most years, reservoir inflow from Corte Madera Creek drops off and the water surface elevation in Searsville Reservoir drops below the crest of the spillway. At this point, water passing down the spillway from the reservoir to lower

Corte Madera Creek ceases. Reservoir outflow is highly correlated with inflow rates, but daily stream flow measurements are not available to present this relationship. Once the reservoir stops spilling, water diversion, evaporation, and groundwater recharge continue to drawdown the reservoir elevation throughout the dry season. Evaporation and recharge rates are unknown, but are likely low since water surface elevations in Searsville Reservoir remain fairly stable, varying on the order of 1-2 meters between flood peak stages and low water at the end of the dry season (Freyberg and Cohen 2001). Seepage of water from the base and sides of the dam keep portions of the lower Corte Madera Creek channel wet through the dry season, but the amount is very small and is inadequate to sustain most native fish and other aquatic biota in lower Corte Madera Creek between the dam and the confluence with Bear Creek.

Water withdrawals at the Searsville Diversion have the effect of reducing stream flow in lower Corte Madera Creek by two means: (1) stream flow may be reduced by up to 3 cubic feet per second (the maximum capacity of the diversion) when the reservoir is spilling and (2) operation of the spillway may cease earlier in the year and, thus, decrease the number of days per year that water spilling to lower Corte Madera Creek. When the diversion is operating and water is spilling at the dam's crest, water withdrawals are likely directly reducing the amount of stream flow in lower Corte Madera Creek in direct proportion to the rate of diversion. This reduction of up to 3 cubic feet per second of stream flow occurs, but not on a daily basis because the diversion does not always operate at this full capacity and does not operate every day. From 1932 to 2008, annual water withdrawals by Stanford from Searsville Reservoir were less than 400 acre-feet in 50 percent of all years and less than 100 acre-feet in 25 percent of all years.[7] For illustration, the Searsville diversion operating at full capacity would withdraw 400 acre-feet of water in approximately 67.3 days. In general, the volume of water diverted at the Searsville Diversion is a small proportion of the water flowing over the dam in the wet season and hydrologic flow peaks are preserved downstream of Searsville Dam. Stream flow in San Francisquito Creek during the wet season is virtually unaffected by operation of the Searsville Diversion, because continuous inflow from Bear Creek maintains creek water levels below the confluence with lower Corte Madera Creek.

During the late spring and summer, water diverted from Searsville Reservoir can make up a significant proportion of the total volume entering the reservoir and flowing over the dam, because inflow from Corte Madera Creek is typically low or dry during this period. Stanford reports that flow over the dam generally stops in late spring or early summer. Water diversion at the Searsville Diversion during periods of low inflow causes the reservoir's water surface elevation to drop faster than it would without water withdrawals. If reservoir inflow rates are less than Stanford's rate of water withdrawals, the water surface elevation can drop below the dam's crest elevation and cause spills to lower Corte Madera Creek to cease earlier in the year.

---

[7] Historical diversion rates (between 1932 and 2008):

- over 700 acre-feet 3 times (4% of the time)
- over 600 acre-feet 10 times (13% of the time)
- over 500 acre-feet 27 times (36% of the time)
- over 400 acre-feet 37 times (49% of the time)
- over 300 acre-feet 47 times (62% of the time)
- over 200 acre-feet 55 times (72% of the time)
- over 100 acre-feet 58 times (76% of the time)

Although flow data is not available to quantify the amount of time that water spilling over Searsville dam cease prematurely, it is likely on the order of a few days to 2-3 weeks in most years because inflow volumes from Corte Madera Creek naturally drop off quickly during the late spring and the rate of Stanford's withdrawal does not exceed 3 cubic feet per second.

4.1.4 Air Quality

This section describes the ambient air quality for the San Francisco Bay Area Air Basin where Stanford University is located.

Air quality is influenced greatly by the sources of emissions and various climatic and topographic conditions. Stanford lies in the Santa Clara Valley, which has high potential for air pollution based on topography, wind patterns, and the high amount of vehicle use.

Stanford is within the San Francisco Bay Area Air Basin of the Bay Area Air Quality Management District (BAAQMD). BAAQMD monitors and enforces district, state of California, and National ambient air quality standards.

4.1.4.1 National and State Ambient Air Quality Standards

National Ambient Air Quality Standards (AAQS) were established by the EPA to set maximum legally allowable concentrations for six pollutants, called criteria pollutants. These six criteria pollutants are ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. State AAQS were established by the California Air Resources Board for the six criteria pollutants and also include limits for visibility reducing particles, sulfates, hydrogen sulfides and vinyl chloride. The BAAQMD operates a network of monitoring sites in the area and maintains a database of air quality data collected from these monitoring locations. The closest monitoring site is located 5 miles north in Redwood City.

The San Francisco Bay Air Basin is an attainment area for all national AAQS set forth in the Federal Clean Air Act with the exception of ozone. In June 2004, the Bay Area was designated a marginal nonattainment area for the national 8-hour ozone standard. With regard to state AAQS, the basin also exceeds the more stringent state AAQS for ozone and fine particulate matter (PM_{10} and $PM_{2.5}$). All other pollutants are designated as "attainment" or "unclassified" for Federal and state AAQS. Air quality standards are typically exceeded when weather conditions are conducive to high pollution levels. These include cold windless nights (for PM_{10}) and hot sunny afternoons (for ozone).

4.1.4.2 Historic Context and Future Trends

Despite an increasing population, the San Francisco Bay Area Air Basin has seen a significant decrease in most air pollutants affecting local air quality since 1975. This is a result of numerous regulations on stationary and mobile source emissions and toxic emissions. Considerable decreases have been achieved for Total Organic Gases (TOG; gaseous organic compounds, including reactive organic gases and relatively unreactive organic gases such as methane), Reactive Organic Gases (ROG; classes of organic compounds that react more rapidly in the atmosphere to form photochemical smog or ozone), nitrogen oxides (NOx), sulfur oxides (SOx) and carbon monoxide (CO). Particulate matter (PM_{10} and $PM_{2.5}$) emissions have remained largely unchanged.

Between 1975 and 2005, TOG were reduced by 736 tons per day, ROG were reduced by 980 tons per day, NOx was reduced by 432 tons per day, SOx by 161 tons per day, and CO by 6,633 tons per day. Past, current, and future estimates for PM10 and PM2.5 show pollutant levels slightly increasing over time. Mobile sources of pollution (e.g., cars, construction equipment)

are a main source of PM10 pollution. Despite increased regulations on these sources, the increases in population, number of miles driven, and number of cars over time has still resulted in increases in PM10 levels in the air basin.

Table 4-2 shows average annual past and current emissions and future estimated emissions, in tons per day (excluding natural sources). The information is also displayed graphically in Figures 4-7 (Average Annual Forecasted Emissions) and 4-8 (Annual Average CO Emissions). Although overall emissions have improved over time, the air basin remains out of compliance for particulate matter and ozone emissions.

Table 4-2. San Francisco Bay Area Air Basin Annual Average Emissions, in Tons per Day

Pollutant	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020
TOG	1666.464	1559.712	1293.374	980.761	844.167	1024.765	930.295	899.899	887.677	888.852
ROG	1366.22	1277.975	1029.001	755.68	631.436	513.364	386.559	337.419	307.275	292.258
Nox	978.755	972.33	909.345	878.127	765.016	658.022	546.909	464.642	389.109	352.376
Sox	214.136	203.199	119.833	123.882	67.51	64.337	54.045	57.292	62.498	68.45
PM10	177.705	178.838	193.418	191.986	188.865	219.318	213.487	225.829	238.39	251.154
PM2.5	86.546	85.35	86.542	88.332	86.409	92.671	90.477	94.258	98.457	102.954
CO	8845.745	8199.568	6996.673	5189.488	3814.378	2798.77	2212.71	1791.737	1455.726	1256.805

Source: California Environmental Protection Agency. 2006. Air Resources Board: 2006 Almanac Data Forecasted Emissions by Summary Category. http://www.arb.ca.gov/app/emsinv/fcemssumcat2006.php last accessed 2/12/07.

In 1996, the San Francisco Bay Area Air Basin experienced 34 days where the state 1-hour ozone standard was exceeded. In 2005 (the most recent data available), the air basin experienced nine days where the state 1-hour ozone standard was exceeded.

The California Clean Air Act requires air basins in non-attainment for the state 1-hour ozone standard to prepare a plan to describe how the air basin will achieve compliance with the standard as expeditiously as practicable. For the San Francisco Bay Area, this document is the 2005 Ozone Strategy prepared by the BAAQMD, the Metropolitan Transportation Commission (MTC), and the Association of Bay Area Governments (ABAG). The 2005 Ozone Strategy documents the implementation of various control strategies through Air District regulations, incentive programs, and transportation programs to improve local air quality and reduce transport of pollution to neighboring air basins.

Mobile source emissions from on-road vehicles emit a large percentage of ozone precursors (ROG and NOx). In the summer of 2005, on-road vehicles emitted 285 tons or 53 percent of NOx emissions and 144 tons or 36 percent of ROG emissions per day (Bay Area Air Quality Management District, 2006). The 2001 Regional Transportation Plan (RTP) for the San Francisco Bay Area specifies how funds for transportation improvements will be spent over the next 25 years. The Federal Clean Air Act requires regional transportation plans to conform to the Federal ozone attainment plan, that is, the proposed improvements cannot contribute to a violation of Federal air quality standards. The Transportation Air Quality Conformity Analysis (Metropolitan Transportation Commission, 2002) reviews the transportation emission budgets

that are the basis for the conformity analysis and then compares the projected motor vehicle emissions from the 2001 RTP to this budget. An emission budget is the amount of a particular pollutant which is associated with attaining the Federal air quality standard, and future on road motor vehicle emissions must be lower than this budget to conform.

4.1.5 Noise

This section describes the existing noise environment, including the primary sources of noise at Stanford. It also explains the location of the Management Zones relative to the primary noise sources.

4.1.5.1 Noise Terminology

Decibels and A-weighted Decibels. Noise is often defined as unwanted sound. Research on human hearing has shown that a 3-decibel (dB) increase in sound is barely noticeable, but a 10-dB increase would be perceived as twice as loud. Noise measurements are given a frequency-dependent adjustment called "A-weighting" in order to more closely mimic how humans hear. A-weighted sound levels are termed "dBA" or "dB(A)."

Noise in the Environment. How well the sounds (dBA) are heard depends on what the surrounding environment is like. Noise levels usually change continuously during the day, and can have a daily, weekly, and yearly pattern. The most common ways to describe noise in terms of the existing environment are called the energy equivalent sound level (L_{eq}), the maximum noise level (L_{max}), and the day-night average sound level (L_{dn}).

Because environmental noise varies with time, it is beneficial to define certain measurement terms to characterize this fluctuating quantity. The true energy average level over a specific period is defined as the equivalent sound level, abbreviated as L_{eq}. It is the sound level during an interval that is equivalent to a perfectly constant level containing the same acoustic energy over the same interval. Hence, L_{eq} provides a measure of the true energy average sound level in an area and includes all sporadic or transient events.

The L_{dn} is the average A-weighted sound level over a 24-hour period with a 10-dB adjustment added to the sound level between 10:00 PM and 7:00 AM. The adjustment accounts for quieter nighttime hours and increased human sensitivity to sound.

4.1.5.2 Existing Noise and Sources

The noise environment at Stanford was assessed in 2000 for the GUP EIR. At that time the measured existing background noise levels were generally within the expected range of the land use where the noise was measured (e.g., urban daytime, commercial area near heavy traffic). The primary source of noise in the Stanford area is from local roadways including: JSB, Sand Hill Road, Page Mill Road/Oregon Expressway, El Camino Real, Embarcadero Road, University Avenue, Alpine Road and Interstate 280. Based on the L_{eq} data taken at five monitoring stations, noise from traffic varied from 57 dBA (typical urban daytime) to 72 dBA (commercial area with heavy traffic). The highest L_{eq} which was 72 dBA was measured in the El Camino Real area (Management Zone 4).

Management Zones 1, 2 and 3 are located in quieter environments than Management Zone 4, where most campus development is located. The primary noise sources in Management Zones 1, 2 and 3 are the county and state roadways around Stanford mentioned above; JSB, Sand Hill Road, Page Mill Road/Oregon Expressway, El Camino Real, Embarcadero Road, University Avenue, Alpine Road and Interstate 280. Sensitive noise receptors in these areas consist of scattered residential use and recreational routes.

Highway 280 near Alpine Road crosses Management Zones 1 and 2 of San Francisquito and Los Trancos Creeks. The remaining length of Highway 280 on Stanford land traverses Management Zone 3. JSB/ Foothill Expressway is bounded on the north by Management Zone 4 until the length between Lagunita and Sand Hill Road where the area varies between Management Zones 1, 2 and 3. The area south of JSB/ Foothill Expressway between Deer Creek and Sand Hill Road is designated as Management Zones 1, 2, and 3. Foothill Expressway south of the Deer Creek stream area is designated Management Zone 4. Much of Sand Hill Road abuts Management Zone 4 except near the golf course where portions of Management Zones 1, 2, and 3 are adjacent to the road. Alpine Road parallels and crosses Management Zone 1. All other major roads that affect the noise environment at Stanford are adjacent to Management Zone 4.

Besides traffic, other significant noise sources noted in the GUP EIR included Caltrain, air conditioning units, heaters, emission stacks, scattered construction activities, and vehicle noise from parking lots. These sources are concentrated in Management Zone 4.

4.1.5.3 Noise Regulations

Santa Clara and San Mateo counties, the cities of Menlo Park and Palo Alto, and the towns of Portola Valley and Woodside all have Noise Elements in their General Plans as well as Noise Ordinances to protect the public from potentially excessive noise. A section on vibration is also included in the Santa Clara County Noise Ordinance. While the noise element is generally used as a planning guideline, a noise ordinance is legally enforceable. The noise ordinances generally establish acceptable noise levels based on land use and time of day and detail restrictions on noise and noise making devices as well as establish exceptions.

4.1.6 Traffic

The affected environment for traffic includes roads at Stanford and in the adjacent Menlo Park and Palo Alto areas (see Figure 4-9, Roadways and GUP EIR Traffic Study Intersections). In 2000, a comprehensive traffic study was conducted for the GUP application, and the results of that traffic study were included in the GUP EIR. The analysis indicates traffic conditions resulting from GUP buildout, which is expected to occur within the timeframe of HCP implementation. The GUP EIR assessed impacts at 43 intersections. The EIR also addressed public transportation, bicycle and pedestrian transportation, arterial roadways, intersections, freeways, and transportation demand management strategies. The results of that traffic study provide the baseline for this EIS when evaluating the potential direct and indirect effects of the Proposed Action and the alternatives on traffic, although only about 30 percent of the GUP development has occurred (Santa Clara County 2009).

The GUP EIR determined that there were significant, unavoidable traffic impacts associated with GUP-related land development. The GUP traffic study projected a net increase in vehicular traffic of 129 inbound trips and 182 outbound trips in the AM peak hour and 347 inbound trips and 450 outbound trips in the PM peak hour. These totals represent trips associated with academic facilities; new on-campus housing units for undergraduate and graduate students, hospital residents/post doctorates, faculty and staff; and a potential arena and performing arts center.

The GUP traffic study proposed a phased mitigation program that includes intersection capacity expansion (Tier 1 and Tier 2), traffic monitoring and travel demand management. The first measure is the "Tier 1 Intersection Capacity Expansion" at selected intersections. Following that, Stanford would undertake a program of traffic monitoring and travel demand management (TDM). The objective of the program would be to modify the travel behavior of students and

Stanford employees such that there would be as few as possible "net new trips" occurring as a result of GUP-authorized land development at Stanford. The number of "net new trips" is defined as the increase in automobile trips during peak commute times in the peak commute direction as counted along a defined cordon around the central campus. Santa Clara County is monitoring compliance.

The final mitigation measure is the Tier 2 Intersection Capacity Expansion. These improvements would require Stanford to contribute its fair share to improving selected intersections in other jurisdictions. The Tier 2 intersection improvements would only be required if trip reduction monitoring determines that Stanford commute trips are increasing by 1 percent or more for any two of three consecutive years.

The GUP traffic study concluded that despite the proposed program of intersection improvements and trip reduction measures, it was not possible to definitively determine that intersection levels of service would be reduced to less than significant levels. Therefore, the projected traffic impacts were determined to be significant and unavoidable.

The final Conditions of Approval for the Stanford University GUP include conditions of approval that apply to traffic. These generally include:

- Modification of specified intersections;
- Continued compliance with transportation requirements established through the 1989 General Use Permit in order to continue mitigating for the population added to the campus under that use permit;
- A program of "no net new commute trips"; if not successful, additional intersection mitigation would be required;
- Traffic level monitoring to determine change in net commute trips;
- Participation in neighborhood traffic studies;
- Project-specific traffic studies for certain development included in the GUP;
- Management of construction traffic;
- Preparation of a Special Events Traffic Management Plan;
- Participation in regular multi-jurisdictional meetings regarding traffic issues on Stanford Avenue and JSB.

4.1.7 Hazardous Materials/Waste

This section defines hazardous materials and hazardous waste, and describes the presence, handling, and use of hazardous materials and hazardous waste at Stanford. Applicable regulations are also described.

A material is considered hazardous if it appears on a list of hazardous materials prepared by a Federal, state, or local agency, or if it has characteristics defined as hazardous by such an agency. Chemical and physical properties such as toxicity, ignitability, corrosivity, and reactivity cause a substance to be considered hazardous. These properties are defined in the California Code of Regulations (CCR), Title 22, Sections 66261.20-66261.24. A "hazardous waste" is any hazardous material that is discarded, abandoned, or recycled. The criteria that render a material hazardous also make a waste hazardous (California Health and Safety Code, Section 25117).

Various Federal and state agencies exercise regulatory authority over the use, generation, transport, and disposal of hazardous substances. The primary Federal regulatory agency is the Environmental Protection Agency (EPA). The primary California state agency is the California Environmental Protection Agency (Cal-EPA), which may delegate enforcement authority to local agencies. The use and handling of hazardous materials are subject to numerous state, county and Federal laws. A description of these various laws and regulations can be found in the Stanford General Use Permit EIR.

The California Accidental Release Prevention law requires the preparation of a Risk Management Plan for facilities that handle more than a threshold quantity of a regulated substance. The list of regulated substances and their threshold quantities can be found in CCR Title 19, and can be downloaded from the California Emergency Management Agency (CalEMA) website. The main components of a risk management plan are: hazard assessment, prevention, and emergency response.

There are no known hazardous waste sites within Management Zones 1, 2, or 3. Hazardous materials and their use mainly occur on the main campus (Management Zone 4) within laboratories and environmental and sanitary service areas, all of which are managed in accordance with applicable Federal, state and local laws. Compliance with these laws and regulations is accomplished through various Stanford environmental health and safety departments, programs, and policies (see Table 4-3, Stanford Environmental Health and Safety Departments, Programs and Policies).

Table 4-3. Stanford Environmental Health and Safety Departments, Programs and Policies (Santa Clara County 2000a)

Department/Plan	Responsibility/Contents
Department of Environmental Health and Safety	Everyday management of health and safety operations at Stanford
Chemical Hygiene Plan/Lab Safety Plans	Describes health and safety responsibilities at laboratory level, information and training requirements, standard operating procedures, and chemical inventories
Hazardous Materials Safety System	Regulates hazardous material transportation, acquisition, use (including training, hazard communication, emergency preparedness and response, and informational signage) and disposal. Tools include: Chemical Safety Database
Chemical Safety Database	Proper emergency response planning and other regulatory compliance
Training	In-house training for all students and employees for safe handling
Campus Emergency Plan	General emergency guidelines
Department Emergency Planning Guidelines	General emergency guidelines
Emergency and Hazardous Materials Release Response Policy	Guidelines for hazardous materials release response
Hazardous Materials Management Plan	Site-specific plans (spill, fire, other emergency and evacuation) for hazardous materials storage areas
Life Safety Box System	Assists emergency response personnel with chemical inventories, room maps, and emergency notification sheets

Table 4-3. Stanford Environmental Health and Safety Departments, Programs and Policies (Santa Clara County 2000a)

Department/Plan	Responsibility/Contents
Stanford Safety Manual	Requirements of the hazard communication program including chemical labeling requirements and the Chemical Safety Database
Biosafety Manual	Safe storage, handling, and disposal of biohazard materials
Radiation Safety Manual	Safe storage, handling, and disposal of radioactive materials
Hazardous Chemical Waste Management Reference Guide for Laboratories	Safe storage, handling, and disposal of chemicals in laboratories
Hazardous Waste Program	Collection, recycling, and disposal of waste chemicals and low-level radioactive waste

4.1.8 Public Services

Most of the utilities and services provided at Stanford University (Management Zone 4) are operated and maintained by Stanford, including electricity, water, and police services. Other services are provided through contracts with outside providers, such as the Palo Alto Fire Department. Utilities and services outside of the main Stanford campus in Management Zones 1, 2, and 3 include police, fire, schools, solid waste, wastewater, electricity and gas. These are supplied by various private and municipal residential and commercial utility service providers and are shown in Table 4-4, Public Service Providers.

Table 4-4. Public Service Providers

Service	Unincorp. Santa Clara CO	Unincorp. San Mateo CO	Portola Valley (Zone 3)	Woodside (Zone 2, 3, 4)	Palo Alto (Zone 1, 2, 3, 4)	Menlo Park (Zone 4)
Police	Santa Clara County Sheriff's Department	San Mateo County Sheriff's Department	San Mateo County Sheriff's Department	San Mateo County Sheriff's Department	City of Palo Alto	City of Menlo Park
Fire	Palo Alto Fire Department	Palo Alto Fire Department	Woodside Fire Protection District	Woodside Fire Protection District	Palo Alto Fire Department	Menlo Park Fire Department
Schools	Palo Alto Unified School District	Las Lomalitas Elementary School District/ Woodside School District	Portola Valley School District	Woodside School District	Palo Alto Unified School District	Menlo Park City School District [6] /Las Lomalitas School District
Solid waste	Peninsula Sanitary Services [3]	Allied Waste	Green Waste [2]	Green Waste [2]	Peninsula Sanitary Services [3]	BFI Peninsula [2]

Table 4-4. Public Service Providers

Service	Unincorp. Santa Clara CO	Unincorp. San Mateo CO	Portola Valley (Zone 3)	Woodside (Zone 2, 3, 4)	Palo Alto (Zone 1, 2, 3, 4)	Menlo Park (Zone 4)
Water	Stanford Utilities Division	Cal Water, Stanford Utilities Division	Cal Water [1]	Cal Water [1]	City of Palo Alto Utilities	Cal Water's Bear Gulch District [1] / Menlo Park Municipal Water District [7]
Waste-water	Palo Alto Regional Water Quality Control Plant	Palo Alto Regional Water Quality Control Plant	Palo Alto Regional Water Quality Control Plant	Palo Alto Regional Water Quality Control Plant	Palo Alto Regional Water Quality Control Plant	Palo Alto Regional Water Quality Control Plant [4]
Electricity and gas	Stanford Utilities Division, PG&E	PG&E	PG&E	PG&E [5]	City of Palo Alto Utilities	PG&E

Sources:
1. www.calwater.com/DistrictProfile.php?d=Bear Gulch
2. http://www.recycleworks.org/resident/map.html
3. Stanford GUP EIR.
4. Miks, 2000 from GUP EIR
5. http://www.woodsidetown.org/departments_services.html#utilities
6. http://www.menlopark.org/departments/pwk/mpmwd_map.pdf
5. http://www.woodsidetown.org/departments_services.html#utilities
6. http://www.menlopark.org/departments/pwk/mpmwd_map.pdf

4.1.8.1 Water Supply System

Stanford obtains drinking and irrigation water from a number of sources in order to maintain reliability, flexibility and cost efficiency. Potable, chloraminated water is provided by the San Francisco Public Utilities Commission (SFPUC). Stanford also maintains groundwater wells that can supply potable water. There is also a non-potable water supply made up of water diversions from Los Trancos Creek, San Francisquito Creek, and Searsville Reservoir (Figure 4-10, Water Diversions and Creek Monitoring Facilities). The non-potable supply is used for irrigation and fire control, but could also be treated and used for drinking water.

Similar to a city, water management facilities at Stanford involve many components, including devices for monitoring and diverting creek water, over 200 miles of water and drainage pipes, reservoirs, dams, deep wells, open channels, fire hydrants, manholes, and meters.

Stanford's current allocation of potable water from the SFPUC is 3.033 million gallons per day (mgd). In the 2000 GUP EIR, GUP-related development was projected to increase average daily consumption of water by 0.61 mgd to 3.21 mgd, which would exceed the allocation. The EIR identified that a minimum decrease in use of 0.18 mgd, (a 6 percent decrease in average daily consumption), would be needed to remain within the current allocation. In order to achieve this decrease in average daily consumption Stanford implemented a Water Conservation and Recycling Master Plan (Maddus Water Management and Stanford University, 2003). Stanford's

average consumption in 2000 was 2.6 mgd. Its current (2010) average usage is 2.14 mgd (Santa Clara County June 2011), representing a 17.7 percent decrease in consumption since 2000.

4.1.8.2 Other Public Services

The Palo Alto Fire Department is under contract with Stanford to provide primary fire protection to most of the unincorporated Stanford lands. The Woodside Fire Protection District provides first response for Guernsey Field (Horse Park at Woodside on portion of Stanford land north of Sand Hill Road) and JRBP. Other services and service providers for the various municipalities and Management Zones including police, fire, schools, solid waste, water, wastewater, electricity, and gas are listed in Table 4-4, Public Service Providers.

4.1.9 Land Use

This section describes Stanford's current land uses and the governmental jurisdictions that regulate Stanford's use of its lands, including potential future land uses. Potential future land uses are subject to the General Plan designations and zoning ordinances described in this section. The relationship between Stanford's current and potential future land uses and the Management Zones described in the HCP is also described.

4.1.9.1 Regulatory Framework

Six local governmental entities have jurisdiction over Stanford University's land uses: Santa Clara and San Mateo counties, the cities of Palo Alto and Menlo Park, and the towns of Portola Valley and Woodside (see Figure 4-11, Governmental Jurisdictions). Santa Clara County and San Mateo County regulate Stanford's land uses within the unincorporated areas of the counties. The cities and towns regulate land uses within their respective borders. The distribution of Stanford's lands in each of the six jurisdictions is listed in Table 4-5, Distribution of Stanford Lands across Jurisdictions.

Stanford's land uses are subject to regulation by applicable general plans and zoning ordinances that are mandated by state law. These include the following:

- Santa Clara County General Plan (1995)/Stanford Community Plan (2000)
- Santa Clara County Zoning Ordinance (2003)
- San Mateo County General Plan (1986) and Zoning Regulations (2002)
- City of Palo Alto Comprehensive Plan (1998) and Zoning Code (1978) and updates
- City of Menlo Park General Plan (1994) and Zoning Ordinance (2006)
- Town of Portola Valley (1998) and Municipal Code
- Town of Woodside (1988) and Municipal Code

Table 4-5. Distribution of Stanford Lands Across Jurisdictions

Jurisdiction	Acres	Percent of Total
Santa Clara County unincorporated	4,017	49%
San Mateo County unincorporated	2,701	33%

Table 4-5. Distribution of Stanford Lands Across Jurisdictions		
Jurisdiction	**Acres**	**Percent of Total**
Palo Alto	1,161	14%
Woodside	114	1%
Menlo Park	111	1%
Portola Valley	76	1%
Total	8,180	100%
Source: Stanford University Land Use and Environmental Planning, C. Palter, pers. comm.		

4.1.9.2 Existing Land Uses

The existing land uses on Stanford lands are reflected in Figure 4-12 (Existing Land Use in Habitat Management Zones). The descriptions in the HCP correspond to how Stanford currently uses the lands, for example for academic use, open space or income-producing commercial use. Eight categories are shown, and these are defined below. The HCP describes current land uses and does not designate any of Stanford's lands for future land uses. Potential future uses are subject to the general plans and zoning ordinances of the six jurisdictions that have land use authority over Stanford.

Stanford's current land uses include the following:

Academic. These lands are currently developed and actively used for academic activities. Most of this use is located in the central campus, and all areas shown as Academic are in Management Zone 4.

Academic Reserve. These lands are currently undeveloped or contain a small amount of developed area and are held in reserve for future academic-related land uses. Academic Reserve lands lie mainly to the south of the central campus, throughout the foothills and contain Management Zones 1, 2 and 3 and small areas of 4.

Biological Preserve. These lands are within the boundary of the JRBP, at the western edge of Stanford. JRBP contains Management Zones 1, 2 and 3 and small areas of 4.

Commercial. Lands currently developed with income-producing commercial uses, including the Stanford Research Park, Stanford Shopping Center, and the Rosewood Hotel located at Sand Hill Road and I-280. All of the land in commercial use is in Management Zone 4.

Institutional. These are lands that are currently developed with institutions that have academic affiliations, and include the SLAC National Accelerator Laboratory, the Stanford Medical Center, and the Carnegie Foundation. The Stanford Medical Center is located in Management Zone 4. The SLAC National Accelerator Laboratory contains Management Zones 2, 3 and 4, and the Carnegie Foundation is located in Management Zone 4 adjacent to Management Zone 1.

Open Space. These open spaces are the open spaces in the central campus area. They include lands that are essential to the historic farm and character of the campus, and designated parks within residential neighborhoods. Most of these lands contain Management Zone 4, with the important exception of the open space next to Lagunita that contains Management Zone 1.

Recreation. Lands available for public recreational use include the driving range, golf course, and recreational routes and trails (Figure 4-13, Recreational Uses). Stanford allows recreational

use of private service roads in the foothills south of JSB commonly called the Dish Trail. In addition, under the final conditions of the GUP, Stanford is required to dedicate easements for, develop, and maintain two public trail alignments. These alignments connect to regional trails and are important for the completion of the Santa Clara County Countywide Trails Master Plan. The Stanford Golf Course and driving range are located on the west side of campus, near the intersection of JSB and Alpine Road.

The Dish Trail is located in Management Zones 1, 2 and 3, and traverses the CTS Reserve. The two public trail alignments are on the west and east sides of the Stanford foothills. On the west side the trail generally follows the alignment of Los Trancos and San Francisquito creeks and then turns east along Sand Hill Road. This trail is in or adjacent to portions of all four Management Zones. The public trail on the east side generally follows Page Mill Road and Arastradero Road; it is also in or adjacent to all four Management Zones, it crosses Matadero Creek twice and parallels a short section of Deer Creek.

The Stanford Golf Course contains land from all four Management Zones. Most of the golf course contains Zone 4; areas adjacent to San Francisquito Creek contain Management Zones 1, 2 and 3.

Residential. These lands are currently developed with housing, and are all in Management Zone 4.

Leaseholds. The existing land uses also include leaseholds for the institutional, commercial and residential uses described above, as well as equestrian and agricultural uses. Leaseholds on Stanford lands are described in the HCP in Section 3.8, and are shown in Figures 4-14, Leaseholds: Agricultural & Equestrian, and Figure 4-15, Leaseholds: Commercial/Institutional. Land uses in the leaseholds include agriculture (seasonal crops, vineyard, plant production/wholesale nursery), equestrian (horse boarding and training, open pasture, trails), grazing (cattle), institutional (SLAC National Accelerator Laboratory; independent research institutions in the Lathrop district), and commercial (Stanford Research Park, Stanford University Medical Center, Stanford Shopping Center, commercial housing). Management Zones 1, 2 and 3 and small portions of 4 include agricultural, equestrian, institutional and grazing leaseholds.

Existing Land Uses by Jurisdiction and Management Zone. All of the jurisdictions contain some amount of Management Zones 1, 2 and 3.

Unincorporated Santa Clara County. This includes the core campus area and most of the foothills east of Alpine Road. Existing land uses in these areas are Academic, Academic Reserve, Institutional, Open Space, Recreation, and Residential (Figure 2-3, Land Use).

Unincorporated San Mateo County. This area lies east of Los Trancos Creek and the portion of San Francisquito Creek downstream of the confluence with Los Trancos Creek. The land uses are predominantly Biological Preserve (Jasper Ridge) and Academic Reserve. There is also Institutional use (SLAC National Accelerator Laboratory), and small areas of Academic and Open Space uses.

City of Palo Alto. These lands include the Stanford Research Park, an area south of Felt Lake, and the Stanford Hospital and Stanford Shopping Center complex. The land uses in these areas are primarily Commercial, but also include Institutional, Residential, and Open Space. Palo Alto lands are located on the northwest and the southeast sides of the central campus (Figure 4-10, Governmental Jurisdictions).

Town of Woodside. A small portion of western Stanford lies in the Town of Woodside, near Searsville Reservoir. Land uses are currently Biological Preserve, Residential, and Academic Reserve.

Menlo Park. A small amount of Stanford land lies in Menlo Park to the north along Sand Hill Road. The current Menlo Park land uses are Commercial, Open Space, Institutional, Recreation, and Residential.

Portola Valley. Portola Valley has jurisdiction over a triangular shaped area near the intersection of Arastradero Road and Alpine Road. Portola Valley's jurisdiction extends on both sides of Alpine Road and thus includes a section of Los Trancos Creek.

Adjacent Land Uses. Stanford University is surrounded by residential, commercial, office park, agricultural uses, and an interstate freeway. Land uses bordering Stanford's Santa Clara County lands are primarily residential, with some commercial uses along El Camino Real. Those in San Mateo County are agricultural, low-density residential and include a small commercial area on Alpine Road in the community of Ladera. Interstate 280 crosses the Stanford foothills. Low-density residential and agricultural uses occur in the foothills in the adjacent towns of Los Altos Hills, Palo Alto, Portola Valley and Woodside. Higher-density residential, commercial and office park uses border the campus in Palo Alto near El Camino Real. There is also higher density residential development north of Stanford in Menlo Park.

4.1.9.3 Potential Future Land Uses based on General Plan Designations and Zoning

Each of the six jurisdictions has zoned Stanford's lands differently in their zoning ordinances and also designate Stanford's land for different land uses within their respective general plans. These are described below for each jurisdiction.

Future development in Zones 1, 2 and 3 at Stanford includes development currently authorized under the GUP issued by Santa Clara County in 2000 and future development that could reasonably occur in Management Zones 1, 2 and 3 beyond the GUP and within the 50-year timeframe of the HCP. This future development beyond the GUP is described in the HCP (Section 3.10.2) as totaling 50 to 150 acres, which could support between 1 and 3 million gross square feet of academic development or 200 to 750 single-family housing units, or a combination of the two, in the 50-year term of the HCP.

Whatever development occurs in the future would need to be consistent with the applicable general plan designations and zoning, as well as with the minimization measures described in the HCP. Such development would also undergo separate environmental review in the jurisdiction where it is located.

4.1.9.3.1 Santa Clara County

The 1995 Santa Clara County General Plan serves as the principal means of setting goals and overall policy direction for physical development and use of lands within the unincorporated area of the county that includes Stanford. In 2000, the County adopted a Stanford Community Plan. The primary purpose of the Community Plan is to guide future use and development at Stanford in a manner that incorporates the County's General Plan principles of compact urban development, open space preservation, and resource conservation.

In 2000, Stanford also received a "General Use Permit," or GUP, which permits its ongoing academic uses and a specified amount of additional academic and housing facilities. The GUP serves as a form of master use permit under which Stanford received approvals for additional development, consistent with the provisions of the County's Zoning Ordinance. The General

Use Permit remains the principal means for implementing the Community Plan. The GUP contains conditions for review of individual projects, as well as provisions requiring certain actions, such as regular monitoring and reporting. When development reaches the limits established by the GUP, Stanford will need to obtain new land use approvals from the County before any additional development can occur.

The Community Plan also established an Academic Growth Boundary (AGB) that contains sufficient land to accommodate the approved GUP development, and perhaps more, depending on Stanford's needs and the County's future land use policies. Inside of the AGB is land that is already developed or that may be developed under the 2000 GUP (Santa Clara County, 2000a). The allowable land uses differ on either side of the AGB. Management Zone 1, 2 and 3 lands occur both inside and outside of the AGB.

The AGB generally follows JSB north from Page Mill Road to just north of Lagunita where the AGB juts into the foothills, skirts the golf course, and ends at Alpine Road. Almost all of the area within the AGB is within Management Zone 4 with the exception of areas adjacent to Lagunita and Campus Drive West which are in Management Zones 1 and 2. The allowable uses inside the AGB are summarized in Table 4-6.

The area containing Management Zones 1 and 2 near Lagunita is within the AGB and is developable under the 2000 GUP. No specific development is currently planned. The other areas of Management Zones 1, 2 and 3 within the AGB are along San Francisquito Creek adjacent to the golf course and are already developed. These areas are also designated as part of the Special Conservation Area in the Community Plan.

Outside of the AGB, the lands that are largely undeveloped are designated in the Community Plan as Special Conservation and Open Space/Field Research (see Table 4-7). Most of Management Zone 1 outside of the AGB is designated as Special Conservation Area, and development is not allowed except when it supports conservation efforts. This includes the portions of Zone 1 adjacent to San Francisquito/Los Trancos and Matadero/Deer creeks as well as most of the tiger salamander habitat south of JSB.

A small portion of Zone 1, and all of Zones 2 and 3 south of JSBare designated as Open Space/Field Research. These include field study, utility infrastructure, grazing/agricultural uses, recreational activities, specialized facilities (e.g., radio antennas), and environmental restoration (Table 4-7). The population density and building intensity are expected to be quite low due to the nature of the uses allowed in the Open Space/Field Research and Special Conservation Area designations. The maximum allowable development on the lands outside the AGB under the GUP is 15,000 gross square feet.

Table 4-6. Santa Clara County: Stanford Community Plan Land Use Designation and Allowable Land Use Inside Academic Growth Boundary

Land Use Designation	Allowable Land Use
Campus Residential- Low Density	a. Single-family housing, duplexes, and townhouses available as residences for Stanford faculty and staff. b. Residential support services such as child care or convenience commercial facilities at a neighborhood-serving level.
Campus Residential- Moderate Density	a. Single-family housing, duplexes, townhouses, condominiums, flats, and apartments available to Stanford faculty and staff.

Table 4-6. Santa Clara County: Stanford Community Plan Land Use Designation and Allowable Land Use Inside Academic Growth Boundary

Land Use Designation	Allowable Land Use
	b. Residential support services such as child care, recreation services, or convenience commercial facilities.
Academic Campus	1. instruction and research (including teaching hospital facilities); 2. administrative facilities; 3. housing intended for students, postgraduate fellows, and other designated personnel; 4. high density housing for faculty and staff; 5. athletics, physical education, and recreation facilities; 6. support services (such as child care facilities, the bookstore, and the post office); 7. infrastructure, storage, and maintenance facilities; 8. cultural facilities associated with Stanford; and, 9. non-profit research institutions with close academic ties to Stanford.
Public School	The use of these lands is limited to public school facilities, including appropriate buildings, parking, playgrounds, and athletics fields.
Campus Open Space	Uses must retain land in open space, and must be consistent with the individual character of each area included in this designation. These areas shall be maintained as park-like areas, unimproved open space, landscape buffers, riparian corridors, and conservation areas. Temporary activities of a limited nature that are in keeping with the open space character are also permitted. Examples include limited duration special events or general recreational activities, such as those regularly occurring in the Oval area. This designation applies to the lands immediately adjacent to Lagunita and along JSB.
Special Conservation Area	See Table 4-5. Although this designation primarily exists outside of the AGB, it extends along San Francisquito Creek at the Stanford Golf Course inside the AGB.
Source: Stanford Community Plan (2000)	

Table 4-7. Santa Clara County: Stanford Community Plan Land Use Designation and Allowable Land Use Outside the AGB

Land Use Designation	Allowable land uses
Open Space/ Field Research	a. field study activities; b. utility infrastructure in keeping with the predominantly natural appearance of the foothill setting; c. grazing and other agricultural uses; d. recreational activities which are consistent with protection of environmental resources (*e.g.*, not construction or operation of a new golf course) and with appropriate policies regarding foothill access; e. specialized facilities and installations that by their nature require a remote or natural setting, such as astronomical or other antennae installations or structures accessory to field study activities; and, f. environmental restoration.

Table 4-7. Santa Clara County: Stanford Community Plan Land Use Designation and Allowable Land Use Outside the AGB

Land Use Designation	Allowable land uses
Special Conservation Areas	The use of these areas is limited to conservation activities and habitat management, field environmental studies, and appropriate agricultural uses. Recreational use may be allowed if it is consistent with the particular environmental constraints of an area. Access for recreational use may be restricted.
Source: Stanford Community Plan (2000)	

4.1.9.3.2 San Mateo County

The land use designations for Stanford lands in San Mateo County are open space, institutional, future study area. The zoning is RE/S11, residential estate. The allowable uses under this zoning are listed in Table 4-8. This zoning allows housing on a 1- to 5-acre minimum lot determined by slope, as well as public parks/playgrounds, farming, residential day care, and kennel/cattery uses. Additional uses that are allowable with a conditional use permit include schools, libraries, fire stations, churches, riding academies, golf courses, and non-commercial clubs.

Table 4-8. Allowable Uses under San Mateo County Zoning

Zoning	Allowable Uses				
R-E	(a) One-family dwellings. (b) Public parks and playgrounds. (c) Crop and tree farming and truck gardening. (d) Home occupations. (e) Accessory buildings and accessory uses, including servants' quarters and one non-commercial guest house, provided, however, that such accessory buildings shall not be constructed until the main building shall have been constructed. (f) Nurseries and greenhouses used only for the propagating and cultivating of plants, provided that no retail sale be allowed. (g) (1) Keeping of pets in association with a one-family dwelling. (2) Limited keeping of pets in association with a second unit. (h) (1) Animal Fanciers in association with a one-family dwelling, subject to an animal fanciers' permit issued in accordance with County Ordinance Code, Division III, Part Two, Chapter 6.3. (2) Catteries in association with a one-family dwelling, subject to a kennel/cattery permit issued in accordance with County Ordinance Code, Division III, Part Two, Chapter 12. (i) Large Residential Day Care Facilities for Children (Family Day Care Homes; 7-12 children), subject to a large family day care permit issued in accordance with the County Zoning Regulations, Chapter 22, Section 6401.2. (j) The following uses subject to securing a use permit in each case: 1. Schools, libraries, fire stations, churches, and riding academies. 2. Golf courses with standard length fairways, and other non-commercial clubs.				
S-11	**Minimum Building Site**	**Minimum Lot Area Per**	**Minimum Yards Required**	**Maximum Height Permitted**	**Maximum Coverage Permitted**

Table 4-8. Allowable Uses under San Mateo County Zoning

Zoning	Allowable Uses								
	Ave. Width (Ft)	Min. Area (Ft)	Dwelling unit (Sq. ft)	Front (Ft)	Side (Ft)	Rear (Ft)	Stories	Ft	
	100	1 to 5 ac.[1]	1-5 ac. [1]	50	20	20	3	36	15

Source: San Mateo County Zoning Regulations (July 1999).

[1] Gross area per dwelling unit and required minimum lot size varies by slope percent.

4.1.9.3.3 City of Palo Alto

The Comprehensive Plan designations and zoning for Palo Alto are shown in Table 4-9. As explained above, the Stanford lands in Palo Alto occur on both the north and south sides of Stanford.

On the north side, Zones 1 and 2 occur along San Francisquito Creek within an otherwise heavily developed corridor. The Comprehensive Plan (Palo Alto's General Plan) designations and zoning reflect current development. Although the current zoning would permit the development of currently undeveloped areas, the remaining undeveloped space in this area will likely remain undeveloped. This is because the areas are small, in streamside open space, and contain Management Zones 1 and 2.

On the south side, Stanford's lands are zoned as Agricultural Conservation District next to Deer Creek, and as Planned Community on Arastradero Road. The Comprehensive Plan designation for these lands promotes primarily open space uses.

Table 4-9. Allowable Uses under Palo Alto Zoning

Comprehensive Plan Designation	Zoning	Allowable Uses
Multiple Family Residential	RM-30 (D)	Medium density multiple family residential with a site and design review combining district.
Streamside Open Space	CC (L); PC-4426; PF	Streamside Open Space is the corridor of riparian vegetation along a natural stream. Hiking, biking, and riding trails may be developed in the streamside open space. The corridor will generally vary in width up to 200 feet on either side of the centerline of the creek. However, along San Francisquito Creek between El Camino Real and the Sand Hill Road bridge over the creek, the open space corridor varies in width between 80 to 310 feet from the center line of the creek. The zoning in this area varies from Community Commercial with a Landscape overlay (only landscaping allowed), to Planned Community and Public Facilities.
Open Space/ Controlled Development	AC (D); PC-1941	Land having all the characteristics of open space but upon which some development may be allowed. Open space amenities must be retained in these areas. Residential densities range from 0.1 to 1 dwelling unit per acre but may rise to a maximum of 2 units per acre where second units are allowed and population densities range from 1 to 4 persons per acre. The zoning includes

Table 4-9. Allowable Uses under Palo Alto Zoning		
Comprehensive Plan Designation	**Zoning**	**Allowable Uses**
		Agricultural Conservation District with a site and design review combining district, and Planned Community.
Source: City of Palo Alto Comprehensive Plan (1999)		

4.1.9.3.4 Town of Woodside

In Woodside, land containing Management Zones 2 and 3 are designated in the General Plan as Open Space/Environmentally Sensitive Area (OS/ESA) and Residential/Environmentally Sensitive Area (R/ESA). The OS/ESA designation requires a 10-acre or larger minimum lot size and no minimum lot size for open space. The R/ESA designation allows a 3- to 10-acre minimum lot size. The zoning is Open Space for Preservation of Natural Resources (OSN) and Special Conservation District (SCP5), as described in Table 4-10. There are no areas of Zone 1 in Woodside.

Table 4-10. Zoning Definitions for Woodside	
Designation	**Allowable Uses**
RR- Rural Residential	Single family dwellings, agricultural uses, home occupations, open space and conservation, bee keeping. Minimum lot size requirement for newly created lots is 3 acres, and increases as the average ground slope increases to maintain rural single family character of the town.
OSN- Open Space for Preservation of Natural Resources	Bee keeping, conservation easements, ecologic study, fences, native plantings, scenic easements, trails, and uses of historic or cultural value.
SCP-5- Special Conservation Planning	Permitted uses include: single family dwellings, agricultural uses, home occupations, open space and conservation, bee keeping. Special rural residential classifications where the minimum lot size is 5 acres. The purpose of this SCP district is to provide for reduced human densities for lands containing characteristics such as, but not limited to, steep hillsides, geological hazards, difficult road access, or soil or water problems.
Source: Town of Woodside General Plan (1988)	

4.1.9.3.5 Town of Portola Valley

Stanford's land in Portola Valley is mostly designated in the Portola Valley General Plan as Conservation-Residential. This designation permits low-density residential development with one housing unit per 2 to 4 acres, depending upon slope and geologic stability. The lands adjacent to Los Trancos Creek are designated as Greenway in the General Plan. Stanford's lands are zoned Residential Estate District/ 3.5 acre minimum/slope density 2/Design review (R-E/3.5A/SD-2/D-R). There are no areas of Zone 1 in Portola Valley.

4.1.9.3.6 City of Menlo Park

There are small areas of Zones 1, 2 and 3 lands in the jurisdiction of Menlo Park. Zone 1 and 2 lands are located along San Francisquito Creek at the Stanford Golf Course. A portion of the area is currently not developable under the City's General Plan because of restrictions on development in riparian zones. The remaining portion is already in the existing golf course

development. These lands are designated in the Menlo Park General Plan as Landscaped Greenways, Buffers or Parkways. There is also a two-acre strip of Zone 3 lands to the west of Alpine Road that is designated as very low density residential in the General Plan.

4.1.9.3.7 Summary of Existing and Future Uses by Jurisdiction

A summary of the area, existing land use, and allowable land use of the Management Zones in each jurisdiction is provided in Table 4-11. The current land use designations for future land use in Management Zones 1, 2 and 3 protect open space and limit the extent of development.

Much of the lands in Management Zone 1 are protected as open space by local general plans and zoning ordinances. In Santa Clara County, currently undeveloped Zone 1 lands are designated as Campus Open Space, Academic Campus, and Special Conservation Area. The areas designated as Academic Campus are limited to areas within the Academic Growth Boundary; the lands immediately surrounding Lagunita within the AGB are designated as Campus Open Space; and the riparian zones and the area outside of the AGB where the CTS Reserve is proposed are designated as Special Conservation Area. In San Mateo County, the lands in Management Zone 1 are zoned as very low-density residential. In Palo Alto, which includes Zone 1 lands adjacent to San Francisquito Creek and Matadero/Deer creeks, the land use designations are Agriculture Conservation District, Commercial with a Landscape Overlay, Planned Community, Public Facilities, and Medium Density Multi-family Residential with Design Review. The designations protect areas adjacent to San Francisquito and Matadero/Deer creeks through design review and specific limitations.

In Menlo Park, the very small areas of Zone 1 are designated in the general plan as Greenways, Buffers or Parkways, and are not available for development. In Portola Valley, Zone 1 lands are adjacent to Los Trancos Creek and are designated as Greenway. There are no Zone 1 lands in Woodside.

Lands in Management Zone 2 in Santa Clara County are designated as Academic Campus and Campus Residential inside the AGB; this includes the Stable site and lands north of Lagunita. Outside of the AGB, in the foothills south of JSB, Zone 2 lands are designated as Open Space/Field Research. The allowed uses are similar to those that currently exist, including limited academic facilities, field research activities, limited recreational use, and agriculture (grazing). In San Mateo County, Zone 2 is zoned as Residential Estates, which allows residential development at a very low density.

In Palo Alto, Zone 2 lands are located along San Francisquito Creek and Deer Creek. They are designated the same as Zone 1 lands: Agriculture Conservation District, Commercial with a Landscape Overlay, Planned Community, Public Facilities, and Medium Density Multi-family Residential with Design Review. The designations protect areas adjacent to San Francisquito and Deer creeks through design review and specific limitations. In Menlo Park, the very small areas of Zone 2 are designated as Greenways, Buffers or Parkways, and are not available for development. There are no Zone 2 lands in Portola Valley. In Woodside, these lands are designated as Open Space and Special Conservation Planning.

Lands in Management Zone 3 in Santa Clara County are designated as Academic Campus inside the Academic Growth Boundary; these areas are at the Stanford Golf Course. Outside of the AGB, the lands in Zone 3 are designated as Open Space/Field Research, and as with Zone 2, the allowed uses are similar to those that currently exist, including limited academic facilities, field research activities, limited recreational use, and agriculture (grazing). In San Mateo County, the lands in Zone 3 are designated for very low density residential uses. In Palo Alto, Zone 3 lands

include a parcel south of Felt Reservoir on Arastradero Road and lands along Deer Creek near the Stanford Research Park. They are designated as Agriculture Conservation District and Planned Community. In Portola Valley, Zone 3 lands are designated for residential use. In Woodside, Zone 3 lands are designated as Open Space and Special Conservation Planning. There are no Zone 3 lands in Menlo Park.

Table 4-11. Acreage, Existing Land Use, and Allowable Land Use of Management Zones

Jurisdiction	Approximate Acres			Current Land Uses			General Plan Designation or Zoning		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Santa Clara County	662	467	1,231	Academic Reserve, Institutional, Recreation, Open Space	Academic Reserve, Recreation, Academic	Academic Reserve, Recreation	Inside AGB: Campus Open Space, Academic Campus Outside AGB: Special Conservation Area	Inside AGB: Academic Campus, Campus Residential – Moderate Density Outside AGB: Open Space/Field Research	Inside AGB: Academic Campus Outside AGB: Open Space/Field Research
San Mateo County	105	34	616	Biological Preserve, Academic Reserve, Open Space	Biological Preserve, Academic Reserve	Biological Preserve, Academic Reserve	R/S-11 (Residential Estates)	R/S-11 (Residential Estates)	R/S-11 (Residential Estates)
Palo Alto	81	63	112	Residential, Institutional, Open Space, Academic Reserve	Residential, Institutional, Open Space, Academic Reserve	Academic Reserve	Agriculture Conservation District, Community Commercial with a landscape overlay, Planned Community, Public Facilities, and Medium density multi-family residential with design review	Agriculture Conservation District, Community Commercial with a landscape overlay, Planned Community, Medium density multi-family residential with design review	Agriculture Conservation District, Planned Community
Woodside	0	59	32	na	Biological Preserve	Academic Reserve	Na	Planned Community, Medium density multi-family residential with design review	OSN, SCP5

Table 4-11. Acreage, Existing Land Use, and Allowable Land Use of Management Zones

Jurisdiction	Approximate Acres			Current Land Uses			General Plan Designation or Zoning		
	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
Menlo Park	8	2	2	Recreation	Recreation	Residential	Greenways, Buffers or Parkways	Greenways, Buffers or Parkways	Very Low Density Residential
Portola Valley	21	0	77	Academic Reserve	Academic Reserve	Academic Reserve	Greenway	Na	Residential

Note: See Tables 4-6 thru 4-10 for General Plan and zoning definitions

4.2 BIOLOGICAL ENVIRONMENT

This section describes the plant communities and wildlife that occur on Stanford lands, including sensitive communities and special-status species. Information on vegetation communities and wildlife is drawn from the results of surveys conducted by the Stanford Center for Conservation Biology, a search of the California Natural Diversity Database, consultation of species lists from the Sacramento Office of the USFWS and other sources. Decades of research in field biology have been completed on Stanford lands including research on special-status species. Additional information about the vegetation communities, wildlife associations, special-status species, their life histories, and reasons for decline can be found in Section 2 of the HCP (see EIS Appendix B).

4.2.1 Overview of Habitat: Plant Communities and Wildlife

4.2.1.1 Plant Communities

Stanford University lands contain several vegetation communities including annual grassland, serpentine grassland, oak woodland/savannah, riparian woodland, perennial and intermittent streams, chaparral, coastal scrub, seasonal wetlands and perennial wetlands associated with freshwater ponds, freshwater lakes/reservoirs and urban/suburban. Along boundaries of plant communities, species composition is mixed. The following is a brief description of the plant species and wildlife found within the different vegetation communities. For a more complete discussion, refer to the Stanford University HCP, Section 2.3.

Annual grasslands are the most dominant plant community on Stanford. The annual grasslands cover the major portions of the foothills as well as the floodplains of the creeks. This vegetation community is dominated by non-native annual grasses such as Italian ryegrass (*Lolium multiflorum*) and wild oat (*Avena spp*.). Several native grasses are also present, most notably purple needle grass (*Nassella pulchra*). Invasive herbaceous plants such as yellow star thistle (*Centaurea solstitialis*) are common also. Common native forbs include blue dicks (*Dichelostemma capitatum*), blue-eyed grass (*Sisyrinchium bellum*) and California buttercup (*Ranunculus californicus*), among others. Some occasional scrub and tree species occur within this vegetation community.

Stanford lands contain two main areas of serpentine grassland, both located in the JRBP. Small areas of serpentine grassland also occur in other areas. Serpentine grassland supports several native plant species including California plantain (*Plantago erecta*) and goldfields (*Lasthenia chrysostoma).*

Oak woodland/savannah occurs in a number of locations at Stanford. This community is dominated by a mix of coast live oak (*Quercus agrifolia*), blue oak (*Quercus douglasii*), valley oak (*Quercus lobata*), and California buckeye (*Aesculus californica*). Common understory species include poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and blue elderberry (*Sambucus mexicana*), among others. Common grass species and herbs present beneath the oak woodland canopy include ripgut brome (*Bromus diandrus*), and soft chess (*Bromus hordeaceous*).

Stanford lands also contain riparian woodlands and perennial and intermittent streams. Most of the creeks within the Stanford HCP area support an 80- to 250-foot-wide corridor of riparian woodland. Riparian woodland is well established along Matadero and Deer creeks, as well as the creeks within the San Francisquito watershed. Riparian woodland is composed of a moderately closed canopy of valley oak and coast live oak trees. Also common are big leaf

maple (*Acer macrophyllum*), western sycamore (*Platanus racemosa*), California buckeye, redwood (*Sequoia sempervirens*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*.) and white alder (*Alnus rhombifolia*), among others. An understory shrub layer is present, especially where gaps in the overstory allow direct sunlight. Typical shrub species include blue elderberry, brown dogwood (*Cornus glabrata*), American dogwood (*C. californica*), seafoam (*Holodiscus discolor*), hairy honeysuckle (*Lonicera hispidula* var. *vacillans*), and common snowberry (*Symphoricarpos albus* var. *laevigatus*). Small clumps of native and non-native grasses and forbs are also present in the understory. Aquatic vegetation is found intermittently along the creek channels, including watercress (*Rorripa nasturtium-aquaticum*) and broad-leaved cattail (*Typha latifolia*). Riparian vegetation around the periphery of Searsville Reservoir consists of a substantial riparian forest dominated by willows (*Salix spp*.), big-leaf maple and dogwood.

Chaparral and coastal scrub is present in the JRBP. Dominant vegetation within the chaparral community is chamise (*Adenostoma fasciculatum*) and yerba santa (*Eriodictyon californicum*). Coastal scrub is found on Coyote Hill and Jasper Ridge. This community is dominated by sagebrush (*Artemisia californica*) and coyotebrush (*Baccharis pilularis*).

Stanford lands contain seasonal and perennial wetlands. The primary seasonal wetlands at Stanford are Lagunita and Skippers Pond. Smaller isolated seasonal wetlands are found within intermittent drainages, including eight seasonal ponds that have been created for tiger salamander. Searsville Reservoir and Felt Reservoir are the primary water bodies at Stanford that support perennial standing water with associated wetlands on their periphery. The wetland vegetation includes cattails (*Typha spp*.), tule (*Scirpus spp*.), and sedges.

The riparian zones around Searsville Reservoir represent a complex mosaic of aquatic and terrestrial habitats. This habitat mosaic is produced and maintained by the dynamic nature of streams channels, sediments, and water levels in the floodplain upstream of Searsville Dam. The distribution of plant species throughout the basin area is influenced by varying levels of tolerance for flooding and shading (Fee et al, 1996). Open Water, Fresh Emergent Wetland and Valley Foothill Riparian biotic habitat types dominate the limnetic and littoral zones of Searsville Reservoir as well as the middle and upper marsh areas (H.T. Harvey and Associates 2001).

The urban/suburban landscape dominates about half of Stanford lands, and includes both native and non-native vegetation growing within the main campus and around residential areas of Stanford. Vegetation consists of remnant native species such as oaks, non-native trees, ruderal annual grasslands, and ornamental plants.

The Management Zones contain the following vegetation communities:

- Management Zone 1 is dominated by riparian vegetation and includes the aquatic habitats associated with San Francisquito, Los Trancos, Matadero and Deer creeks, and Lagunita. It also includes grassland and oak savannah associated with Lagunita and the foothills immediately south of JSB at Lagunita;
- Management Zone 2 contains riparian, oak woodland and grassland vegetation and the aquatic habitat associated with Searsville Reservoir;
- Management Zone 3 contains primarily grassland vegetation with some oak savannah, and the aquatic habitat associated with Felt Reservoir and ephemeral drainages to Los Trancos and Matadero creeks.

4.2.1.2 Wildlife

Vegetation communities on-site provide suitable foraging, cover, and nesting habitat for a large number of common amphibians, reptiles, birds, and mammals within the Stanford HCP area. Many of these species are not specific to one vegetation community, especially for omnivorous and predacious species that utilize a variety of habitats.

Annual grasslands provide habitat for a diversity of wildlife, which use this habitat for foraging, cover, or nesting. Some common wildlife that use grassland habitat include western toad (*Bufo boreas*), western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleuca*), western meadowlark (*Sturnella neglecta*), red-winged blackbird (*Agelaius phoeniceus*), deer mouse (*Peromyscus maniculatus*), bobcat (*Lynx rufus*), and California ground squirrel (*Spermophilus beecheyi*). A wide range of reptiles, mammals, and birds can also be found in serpentine grasslands.

The oak woodland provides shelter, shade, breeding, and foraging habitat for common wildlife species such as western gray squirrel (*Sciurus griseus*), acorn woodpecker (*Melanerpes formicivorus*), raccoon (*Procyon lotor*), black-tailed or mule deer (*Odocoileus hemionis*) coyote (*Canis latrans*), and striped skunk (*Mephitis mephitis*).

Riparian woodlands provide abundant food, cover, and/or breeding habitat for large number of wildlife species including California quail (*Callipepla californica*), black phoebe (*Sayornis nigricans*), red-shouldered hawk (*Buteo lineatus*), raccoon, tree squirrels (*Sciurus sp*.), Mexican free-tailed bat (*Tadarida brasiliensis*), California myotis bat (*Myotis californicus*), hoary bat (*Lasiurus cinereus*), Pacific treefrog, and salamanders (*Ensatina spp., Aneides spp.*) among others. Chaparral provides habitat for California quail and gray fox (*Urocyon cinereoargenteus*), among others.

In addition, the Matadero and San Francisquito creek systems provide habitat for fish species. Native fish recorded from these creek systems include three-spined stickleback (*Gasterosteus aculeatus*), roach (*Lavinia symmetricus*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento suckers (*Catostomus occidentalis*), and sculpin (*Cottus asper* and *C. gulosus*). Steelhead/rainbow trout (*Oncorhynchus mykiss*) are abundant in the San Francisquito system, but have not been recorded in the Matadero system in recent surveys conducted by Stanford (but have been reported as being historically present by numerous long-term local residents). Hitch (*Lavinia exilicauda*) are also present in the San Francisquito system. Steelhead spawn throughout the San Francisquito Creek system, including those portions that flow through Stanford. Searsville Dam is a barrier to fish migration in the system, and prevents steelhead from accessing about one-third of the San Francisquito Creek watershed. It is estimated that between 8 and 18 miles of suitable habitat for steelhead spawning and juvenile rearing exists in the upper watershed (Smith and Harden 2001; Bjorkstedt et al. 2005; Spence et al. 2012; personal communication with Matt Stoecker, Beyond Searsville Dam, Director, September 20, 2010). Resident rainbow trout are present in the creeks above Searsville Dam (notably Corte Madera Creek and Sausal Creek), and are scattered throughout the system.

Non-native aquatic animals that have been recorded from the creeks at Stanford include bullfrog (*Rana catesbeiana*), catfish (*Ictalurus spp*.), crayfish (*Pacifastacus leniusculus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), red-ear sunfish (*Lepomis microlophus*), mosquito fish (*Gambusia affinis*), largemouth bass (*Micropterus salmoides*), Louisiana red swamp crayfish (*Procambarus clarki*), and signal crayfish (*Pascifasticus leniusculus*).

4.2.2 Covered Species

4.2.2.1 California Red-legged Frog

The red-legged frog (*Rana draytonii*) is federally listed as Threatened and is a California Species of Special Concern (CSC). This species occurs in isolated localities in the Sierra Nevada, northern Coast and northern Transverse Ranges, and is still locally abundant the San Francisco Bay Area. Red-legged frogs require permanent or nearly permanent bodies of water for persistence. They are known to occur within grassland, riparian woodland, oak woodland, and coniferous forests, but require quiet pools, slow-moving streams, and marshes with heavily vegetated shores for reproduction. They occasionally traverse over 1 mile or more though upland habitats during rainy periods when seeking out new breeding locations. During warmer periods, red-legged frogs can be found in rodent burrows in upland habitats. For this reason, red-legged frogs require breeding habitats (ponds/ streams) along with adjacent upland dispersal corridors between breeding habitats for long-term persistence.

Red-legged frogs have been monitored annually on Stanford lands since 1997. These surveys have documented two distinct red-legged frog populations, one along Matadero and Deer creeks, and one along San Francisquito Creek (Figure 4-16, California Red-legged Frog at Stanford). Prior to the construction of Highway 280 and the general suburban buildup of the area, it is likely that these two populations were part of a single, more widespread population.

Annual surveys conducted since 1997 have documented red-legged frog reproduction in Deer Creek and Matadero Creek and in a pool associated with the "Upper Quarry." Red-legged frog reproduction in Matadero Creek appears to be very limited, with only a few tadpoles surviving to metamorphosis each year. In some years, Deer Creek is more productive, with large numbers of mature tadpoles (hundreds) and metamorphs (tens) observed in comparatively wet years. However, it appears that no successful red-legged frog reproduction occurs in Deer Creek during conditions of moderate to severe drought. Reproduction in the quarry pool is fairly consistent, but the pool is somewhat unusual because red-legged frog tadpoles are present in the pool year-round (Fellers et al. 2001).

Red-legged frogs also are found along the Stanford portions of San Francisquito Creek. Recent observation of red-legged frogs in San Francisquito Creek have been limited to the reaches located downstream from the confluence with Bear Creek (in the JRBP) to within 1.5 kilometers (along the creek) upstream from the Interstate 280 bridge. Red-legged frog reproduction in this area has been variable, with few tadpoles (~20) seen most years since 1997, but with 50+ seen in some years (particularly when weather conditions have caused side-pools to form).

Red-legged frogs also are known to occur along Los Trancos Creek. Los Trancos Creek provides cool, clear water that is not typically red-legged frog habitat. However, the creek corridor may serve as a dispersal corridor. Most of the recently observed frogs were found well upstream of Stanford, and there is only a single recent record of a red-legged frog from Stanford's portion of Los Trancos Creek. In 1995, a single frog was repeatedly observed in the roots of a large bay tree located just downstream of the Los Trancos Diversion facility.

All red-legged frog breeding habitat on Stanford lands is found in Management Zone 1 (Figure 4-16, California Red-Legged Frog at Stanford). Due to the dispersal ability of this species, red-legged frog can also occur in Management Zone 2 and, on rare occasions, wander outside of these Zones.

4.2.2.2 California Tiger Salamander

The tiger salamander (*Ambystoma californiense*) was federally listed by the USFWS as Threatened in September 2004 under the ESA and state listed as Threatened under the California Endangered Species Act (CESA) in 2010. Tiger salamander ranges from the Sierra Nevada crest (just west of it) to the outer coast range and from Sonoma and Yolo counties on the north to Santa Barbara County in the south. Tiger salamander requires a mosaic of habitats consisting of seasonally filled pools located in or near grasslands or oak woodlands. Semi-permanent ponds, reservoirs, and portions of slow-moving, seasonal creeks may also be used. For most of the year, tiger salamanders live in the burrows of ground squirrels, gophers, and other rodents in open wooded or grassy areas. However, they may also use man-made structures such as underground utility boxes and drainage pipes. They do not emerge to breed every year.

At Stanford, the tiger salamander population is concentrated around Lagunita, a man-made reservoir located in the north central portion of Stanford University (Figure 4-17, California Tiger Salamander at Stanford). The tiger salamander uses burrows in the grasslands south of Lagunita, and migrates across JSB in the rainy season to breed in the reservoir. The density of tiger salamanders decreases significantly as the distance from Lagunita exceeds 0.62 mile. Few if any tiger salamanders are present in the heavily developed areas close to Lagunita (mainly to the north). Numerous barriers (curbs, steps, buildings, walls, etc.) are present within the main campus that may cause this part of Stanford to act as a population sink. Individual tiger salamanders that wander from Lagunita northward to this area are unable to migrate back, and are lost to the population.

Stanford University entered into the California Tiger Salamander Management Agreement (CTS MA) with the USFWS, the CDFG, and the County of Santa Clara on June 1, 1998, prior to the species' listing. The Agreement fulfilled a condition of Architectural and Site Approval of Santa Clara County for the Graduate Student Housing project at Governor's Corner. The purpose of the CTS MA was to set forth a mitigation plan for possible impacts to tiger salamanders at Stanford. The CTS MA addressed current activities and facilitated the approval of future activities located within the tiger salamander habitat on Stanford lands. Implementation of the CTS MA included the installation of an experimental research migration tunnel under JSB to reduce the number of animals killed on the road, and the construction of new experimental breeding ponds in the grassland south of JSB (to provide an alternative to Lagunita). These ponds and first tunnel were considered experimental activities because they were the initial attempts at design and construction to be evaluated upon completion. In Fall 2003, following two years of consultation and permitting by the Service, CDFG, California Regional Water Quality Control Board, USACE, and Santa Clara County, the two remaining ponds were reconstructed and enlarged, and six additional ponds were built. In 2006, Tiger salamanders reproduced in two of the ponds. Stanford has also installed experimental piles of woody debris near the breeding ponds to encourage ground squirrel activity and benefit tiger salamander. Also, the initial experimental tunnel was supplemented by three additional tunnels. Now that the tiger salamander is a listed species, the HCP will supersede the CTS Management Agreement.

Tiger salamander habitat on Stanford lands is in Management Zones 1, 2 and 3 (Figures 3-1, Management Zones and 4-17, California Tiger Salamander at Stanford).

4.2.2.3 Western Pond Turtle

The pond turtle (*Clemmys marmorata*) is a California Species of Special Concern. It is included as a Covered Species because of the reasonable possibility that it could become a federally listed species during the 50-year term of the HCP. Preferred habitat of pond turtle consists of calm

waters, such as streams or pools with vegetated banks and basking sites such as logs or rocks. They may use upland areas to excavate nests as far as 0.3 mile away from water. Nests are excavated in compact, dry soils, with high clay or silt content, in areas consisting of short grasses or forbs.

Pond turtles are the only native turtles found at Stanford. They are found scattered throughout San Francisquito Creek, from Searsville Dam to the downstream edge of Stanford's boundary (Figure 4-18, Western Pond Turtle at Stanford). In the JRBP, they have been historically found along marshier areas of Searsville Reservoir. Pond turtles were found in Searsville Reservoir through the mid-1990s, but there have been no recent records from the reservoir. Likewise, surveys in creeks and ponds upstream from Searsville Reservoir have not documented the presence of pond turtles in the last 5 years.

The number of turtles, including both pond turtles and various non-native turtles, present at Felt Reservoir varies considerably from year to year. The Stanford Water Department and Public Safety personnel report that over the last 40 years or so turtles have been irregularly observed at Felt Reservoir. In some years, no turtles are observed; while in other years upwards of ten turtles have been observed. Biological surveys during the last decade have also found inconsistent numbers of turtles at Felt Reservoir. Some of this variation is undoubtedly due to differences in the observers and to the variable physical factors of the reservoir (mainly the large fluctuations in water level) that make it difficult to see turtles that may be present in the reservoir when it is relatively full. While these factors may account for some of the differences in the number of turtles that are actually observed each year, the number of turtles in Felt Reservoir actually does vary considerably from year to year.

Pond turtles present in Felt Reservoir are likely individuals released at the site. There are no areas recently occupied by the species within a distance a pond turtle could reasonably expect to disperse. San Francisquito Creek is approximately 1.1 miles from Felt (at its closest point), but a turtle would need to cross either Alpine Road and Los Trancos Creek, or Highway 280 to go overland directly to Felt Reservoir. The intervening agricultural lands would also make overland dispersal from San Francisquito Creek to Felt Reservoir very unlikely. It is also very unlikely that a turtle would disperse upstream in Los Trancos Creek from San Francisquito Creek and then either travel overland for 0.25 mile to the reservoir, or traverse the entire 2.25 miles of Los Trancos Creek on Stanford property then, go down the cement-lined water diversion flume 0.5 miles to Felt Reservoir. Despite annual surveys of the creek since the mid-1990s, there are no records of any turtles in the Stanford portion of Los Trancos Creek. Likewise, there has been no recent documentation of pond turtles from Boronda Lake, located 0.6 mile from Felt Reservoir in Palo Alto's Arastradero Preserve.

While no pond turtles have been observed by recent surveys in Matadero and Deer creeks, local residents report that turtles were present in the area, at least through the 1980s. Pond turtles have not been found at Los Trancos Creek, which provides cool, clear, flowing water that is not typically pond turtle habitat.

Pond turtles are occasionally found well away from waterways; along paths and roads at Jasper Ridge, near the Stanford golf course, along Palm Drive, and the Stanford Shopping Center. These specimens are probably either individuals leaving the creek-bed during the beginning of the rainy period (when many turtles apparently take cover in upland areas), or are females looking for places to lay eggs.

Habitat for pond turtle is primarily confined to Management Zones 1 and 2, however individual pond turtles may wander into the other zones (Figures 3-1, Management Zones and 4-18, Western Pond Turtle at Stanford).

4.2.2.4 Steelhead

The Central California Coast (CCC) Distinct Population Segment (DPS) of steelhead (*Oncorhynchus mykiss*) is a population of an anadromous fish that is federally listed as Threatened. Steelhead is native to coastal streams from Baja California to Alaska and parts of Asia. Adult steelhead migrate from the ocean into streams in the late fall, winter, or early spring seeking out deep pools within fast moving water to rest prior to spawning. Steelhead spawn in shallow-water gravel beds during the period between December and April. Steelhead juveniles rear in freshwater until they become large enough to migrate to the ocean (smolts) to finish rearing and maturing to adults.

The San Francisquito Creek watershed winter-run steelhead population represents one of only a few known remaining runs in South San Francisco Bay. Within the Stanford HCP area (San Francisquito Creek, Los Trancos Creek, lower Corte Madera Creek, and Bear Creek), adult steelhead spawn, eggs incubate, juveniles rear, and smolts outmigrate (Figure 4-19, Steelhead at Stanford). Young steelhead generally rear in the creeks for 1 or 2 years. The mainstem of San Francisquito Creek within the HCP study area is essential for the immigration of adults and the emigration of smolts. The most important spawning and rearing habitat for steelhead in the San Francisquito Creek system is in Los Trancos Creek, San Francisquito Creek (from Searsville Reservoir to JSB), and Bear Creek and its tributaries.

Information from habitat surveys and biological monitoring between 1997 and 2006 indicates that spawning and rearing habitat in San Francisquito Creek is limited and degraded for steelhead (Launer and Spain 1998, Launer and Holtgrieve 2000, H.T. Harvey & Associates 2001, Jones and Stokes 2006). Summer stream flow is low, even in wet years, in San Francisquito Creek and restricts the quantity and quality of available rearing habitat for juvenile steelhead. Most of the habitat in San Francisquito Creek is dominated by large pools with slow moving water (Jones and Stokes 2006), which provide limited feeding opportunities for steelhead in the summer. Juvenile steelhead prefer faster water areas where drifting insects are abundant. Jones and Stokes (2006) concluded juvenile steelhead rearing habitat in San Francisquito Creek is limited by low abundances of boulder and cobble aggregations, lack of large woody debris, and lack of backwater habitat.

Adult steelhead spawning habitat is also limited in the mainstem of San Francisquito Creek. In the reach between the confluences with Bear Creek and Los Trancos Creek, San Francisquito Creek is dominated by bedrock and spawning gravels are scarce, and suitable spawning gravel is similarly scarce downstream of Los Trancos Creek (Northwest Hydraulic Consultants 2004). Observed densities of juvenile steelhead in this reach may be explained, in part, by fry and juveniles moving from tributaries to rear in San Francisquito Creek during the summer and fall months (Northwest Hydraulic Consultants 2004).

Steelhead habitat in the 0.3-mile reach of Corte Madera Creek between Searsville Dam and the confluence with San Francisquito and Bear creeks is limited by dry conditions during the summer and low abundance of suitable spawning gravels (H.T.Harvey and Associates 2001). Retention of sediments in Searsville Reservoir has coarsened the creek bed immediately downstream of the dam and many instream areas are dominated by boulders and bedrock. Rocky floodplains and overbank areas with very little soil deposition or soil development characterize the stream bank areas below Searsville Dam (Northwest Hydraulic Consultants 2004).

Stanford's water withdrawals at the reservoir affect stream flow in lower Corte Madera Creek during the steelhead smolt outmigration period by reducing flows (up to 3 cubic feet per second) and the reach likely de-waters a few days to 2-3 weeks earlier in the spring in most years due to Stanford's water withdrawals. Low and dry stream flow conditions during the summer and fall months create unsuitable conditions for year-round juvenile rearing in lower Corte Madera Creek.

Bear and Los Trancos creeks are steeper and provide better habitat for steelhead than San Francisquito Creek (Northwest Hydraulic Consultants 2004). Launer and Holtgrieve (2000) report quality spawning habitat is present in both Bear and Los Trancos creeks. Short-term surveys in Los Trancos Creek during 2002 and 2003 identified steelhead redds in the lower 6 miles of Los Trancos Creek (SCVWD 2004; Vogel 2002). The results of juvenile steelhead sampling by Stanford indicates summer and fall juvenile abundance was 4 to 5 times higher in Los Trancos and Bear creeks than in San Francisquito Creek (Launer and Spain 1998; Launer and Holtgrieve 2000). Rearing habitat is likely better in Bear Creek than in Los Trancos Creek because stream flow in Bear Creek is perennial, whereas stream flow in Los Trancos Creek becomes intermittent in dry water years.

Sampling of juvenile steelhead in the San Francisquito Creek watershed provides information on summer rearing densities. Appendix G summarizes the available information on steelhead collections and observations in the San Francisquito Creek Watershed. The results of single-pass electrofishing conducted by Stanford from 1997 to 2000, indicate juvenile steelhead abundances range from 0 to 19 fish per 100 feet on Stanford lands (Launer and Spain 1998, Launer and Holtgrieve 2000, and Launer 2010). Stanford has extended these fish density estimates to the entire 9 miles of stream habitat on Stanford lands to estimate a population of 1,500 to 9,000 juvenile steelhead. In 2004, 80 juvenile steelhead were captured from 580 linear feet of San Francisquito Creek dewatered for construction purposes (D.W Alley & Associates 2004) and this generates a juvenile density estimate of approximately 14 steelhead per 100 feet. For construction of the SHEP in 2009, juvenile steelhead were observed at a density of approximately 14 fish per 100 feet in Los Trancos Creek and eight fish per 100 linear feet in San Francisquito Creek. No information is available regarding the abundance of adult steelhead in the watershed.

Upstream and downstream passage of steelhead in the San Francisqutio Creek watershed is limited by seasonal low stream flow conditions and man-made barriers. Peak smolt outmigration coincides with the time period where stream flows in the watershed begin to decline rapidly (March to May) making downstream migration difficult past man-made structures and through reaches with highly impermeable stream bed. Adult upstream migration may also be limited by low flow conditions in San Francisquito Creek. Man-made passage impediments in San Francisquito Creek include a concrete grade control structure approximately 4 miles upstream of San Francisco Bay (known as the Bonde Weir), Stanford's old Lagunita Diversion Dam at approximately creek mile 7.5, and a concrete road crossing in the JRBP at creek mile 11.6.

The most significant man-made barrier in the watershed is Stanford's Searsville Dam. This dam is a complete barrier to the upstream migration of adult steelhead and approximately one-third of the San Francisquito watershed is not available to steelhead due to this structure. Above Searsville Dam steelhead spawning and rearing habitat historically occurred in Corte Madera, Dennis Martin, Alambique, Sausal, and Westridge creeks. Together these creeks and their tributaries make up 32 percent (14 square miles) of the San Francisquito Creek watershed (Freyberg and Cohen 2001). Stoecker (2002), as cited in Leidy et al. (2005), reports 10 miles of historic habitat above Searsville Dam. Stoecker later updated his estimate to 18 miles of habitat

upstream of the Dam (personal communication with Matt Stoecker, Beyond Searsville Dam, Director, September 20, 2010). In 2005, a NMFS Technical Recovery Team applied GIS-based habitat modeling to the San Francisquito Creek watershed (Bjorkstedt et al. 2005; Spence et al. 2012) and this approach generated an estimate of 9 miles of potential steelhead habitat upstream of Searsville Dam. Smith and Harden (2001) report Corte Madera Creek and its associated tributaries contain over 8 miles of spawning and rearing habitat above Searsville Dam.

Non-native aquatic species such as catfish, crayfish, bullfrog, mosquito fish, green sunfish (*Leopomis cyanellus*), bluegill, pumpkinseed (*Lepomis gibossus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass, and red-eared sunfish (*Lepomus microlophus*) have been found to inhabit areas of lower Corte Madera Creek and San Francisquito Creek (Launer and Holtgrieve 2000; Launer and Spain 1998; Fee et al. 1996). These non-native species are predators of and competitors with steelhead. Searsville Reservoir was found to support abundant non-native species and is likely the main source of non-native species to areas below Searsville Dam (Launer and Holtgrieve 2000; Launer and Spain 1998; Fee et al. 1996). The distribution of these non-native fish species appears to be limited to the reach extending downstream of Searsville Dam to about the confluence with San Francisquito Creek and they do not seem able to form self-sustaining populations within San Francisquito Creek itself (Launer and Spain 1998; Launer and Holtgrieve 2000). Steelhead habitat on Stanford lands is entirely in Management Zone 1 (Figures 3-1, Management Zones and 4-19, Steelhead at Stanford).

4.2.2.5 San Francisco Garter Snake

The San Francisco garter snake (*T.s. tetrataenia*) and red-sided garter snake (*T.s. infernalis*) are two distinct subspecies of the common garter snake (*Thamnophis sirtalis*). The San Francisco garter snake is listed as endangered under the ESA and is state fully protected. The red-sided garter snake is not a federally listed species. Both of these subspecies have been found on the San Francisco Peninsula.

On the San Francisco Peninsula there is a fairly well-documented intergrade zone between the San Francisco garter snake and red-sided garter snake. This intergrade zone is located on the eastern flank of the Santa Cruz Mountains (Barry 1994, Fox 1951). Stanford is considered within this intergrade zone. The intergrade populations do not belong exclusively to either the red-sided garter snake subspecies or the San Francisco garter snake subspecies. In the HCP and EIS, the San Francisco garter snake, red-sided garter snake, and intergrade populations are referred to collectively as "local subspecies" or "garter snakes."

Populations found in an intergrade zone generally include individuals exhibiting a range of color patterns and can include individuals with physical characteristics of one or both of the subspecies; they can also clearly include one subspecies or another. The legal status of this intergrade form currently is not clear. At present the draft regulations state that if the individual has more than 50 percent of the listed characteristic it is considered to be the listed entity (which is the San Francisco garter snake). The USFWS considers regulation of intergrades on a case-by-case basis.

Stanford is within the southern portion of the red-sided/San Francisco garter snake intergrade zone. The intergrade populations have been studied at Stanford and the vicinity sporadically for nearly 100 years. At the present time, garter snakes are infrequently encountered at Stanford. A few individuals are encountered at Lagunita every year, but specimens from other locations at Stanford are only very infrequently observed. Given the number of museum records and mentions in the scientific literature, it is likely that historically the intergrade populations were more common in the area.

The intergrade populations found at Stanford exhibit color patterns that are generally more characteristic of red-sided garter snakes. A 1994 study of 47 snakes found in the Palo Alto area, which included Lagunita and areas near San Francisquito Creek, found that approximately 20 percent of the 47 snakes exhibited a red-sided garter snake color pattern and the remaining, approximately 80 percent, exhibited an intergrade color pattern (Barry 1994). An additional 12 snakes that the study observed just south of Stanford, at Boronda Lake in Foothill Park in Palo Alto, all exhibited a red-sided garter snake color pattern (Barry 1994). The study indicates that the intergrade population (or populations) at Stanford have a color pattern that is more similar to the red-sided garter snake than to the San Francisco garter snake.

This conclusion is further supported by California Academy of Science specimens noted in a 1981 study of 35 individual snakes collected at and near Stanford (Seib and Papenfuss 1981). The museum records classified 18 as red-sided garter snakes, 16 as having an intergrade color pattern, and one as a San Francisco garter snake.

On Stanford lands in southern San Mateo County the taxonomic status of the local subspecies is the least clear. Stanford and other researchers have repeatedly surveyed areas near Sand Hill Road and Highway 280 for red-legged frogs and San Francisco garter snakes. These surveys were done at the SLAC National Accelerator Laboratory and the nearby former Christmas tree farm (Barry 1976, Balgooyen 1981, Seib and Papenfuss 1981, Westphal, Seymour, and Launer 1998, Launer 2005/2006). With the exception of one intergrade captured in 1981 in a drainage near the main SLAC National Accelerator Laboratory building, no snakes were observed during any of these surveys.

Populations of the local subspecies are typically associated with permanent or nearly permanent bodies of water, usually areas of shallow water and heavily vegetated shores. However, they are known to occur, at least temporarily, in grassland, riparian woodland, oak woodland, and coniferous forest. Sag ponds in the San Andreas Fault rift zone and freshwater coastal marshes are considered prime habitat for the San Francisco subspecies.

Although garter snakes have not been observed in the vicinity of San Francisquito Creek or Searsville Reservoir, those areas provide potential habitat. Garter snakes have not been found at Los Trancos Creek, which provides cool, clear, flowing water that is not typically garter snake habitat.

Garter snake habitat on Stanford lands is in Management Zones 1, 2 and 3.

4.2.3 Other Special-Status Species

Several plant and animal species that occur on Stanford lands have a special status with other agencies. These species are listed by the state or other recognized groups as species that may be declining in number and should be carefully considered in the course of land use planning. The majority of special-status species on Stanford lands are associated with the same habitats as the Covered Species. Serpentine-based species on the JRBP are the exception.

4.2.3.1 Plants

The Stanford University Center for Conservation Biology has documented over 1,000 native plant species on Stanford lands from surveys and historical records. Of these, 10 special-status plant species are known to currently occur within the Stanford HCP area (Table 4-12, Special-Status Plant Species). Table 4-12 also includes plants that were historically recorded either on or in the vicinity of Stanford lands, but which have not been found in several years, and are presumed to not occur there.

Table 4-12. Special-Status Plant Species

Scientific Name	Common Name	Status	Habitat Requirements/ Habitat at Stanford	Flowering Period	Status at Stanford
Allium peninsulare var. *franciscanum*	Franciscan onion	CNPS 1B.2	Grasslands, oak savannah habitats, often serpentine Habitat in Zones 2 and/or 3.	May – June	Present at Jasper Ridge
Arabis blepharophylla	coast rock cress	CNPS 4.3	Rocky outcrops, steep banks in coastal scrub and prairie. Habitat in Zones 2 and/or 3.	February – May	Present at Jasper Ridge
Dirca occidentalis	western leatherwood	CNPS 1B.2	Foothill woodland and riparian forest. Habitat in Zones 1 and 2.	January – March	Present at Jasper Ridge and on Los Trancos Creek upstream of Stanford. Expected to occur in San Francisquito and Los Trancos creek corridors.
Lessingia hololeuca	woolly-headed lessingia	CNPS 3	Ultramafic, clay soils in coastal scrub, coniferous forests, and valley and foothill grasslands. Habitat in limited areas of Zones 1, 2, and 3.	June – October	Present at Jasper Ridge, foothills. Historically reported near Woodside, Portola Valley, and Los Trancos Road in Thomas, 1961.
Lessingia tenuis	spring lessingia	CNPS 4.3	Dry, open slopes. Serpentine habitat in limited areas of Zone 3.	May – July	Present at Jasper Ridge. Historically reported near Searsville and Jasper Ridge in Thomas, 1961.
Leptosiphon (*Linanthus) ambiguus*	serpentine linanthus	CNPS 4.3	Ultramafic grasslands, coastal scrub and foothill woodland. Habitat in limited areas of Zones 2 and 3.	March – June	Present at Jasper Ridge. Historically reported in Woodside in Thomas, 1961.
Malacothamnus arcuatus[8]	arcuate bush mallow	CNPS 1B.2	Ultramafic chaparral. Habitat in Zone 2 and limited areas of Zone 3.	April – September	Present at Jasper Ridge. Historically reported as near Stanford in Thomas, 1961.
Perideridia gairdneri ssp. *gairdneri*	Gairdner's yampah	CNPS 4.2	Moist soil of flats, meadows, stream sides, grasslands and pine forests. Habitat in Zones 1, 2, and/or 3.	June – October	Present at Jasper Ridge. Historically reported as near Palo Alto in Thomas, 1961.

[8] There are recent taxonomic questions about *M. arcuatus*; the Jepson Manual currently considers this species to be synonymous with the more common *M. fasciculatus*. (http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?5042,5073,5079; accessed 8/13/09)(http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?5042,5073,5079; accessed 8/13/09)

Table 4-12. Special-Status Plant Species

Scientific Name	Common Name	Status	Habitat Requirements/ Habitat at Stanford	Flowering Period	Status at Stanford
Piperia michaelii	Michael's piperia	CNPS 4.2	Coastal scrub, prairie, foothill woodland, mixed-evergreen and closed-cone pine forest. Habitat in Zones 1, 2, and 3.	April – August	Present at Jasper Ridge. Historically reported at Coal Mine Ridge (Los Trancos).
Plagiobothrys chorisianus var. hickmanii	Hickman's popcorn flower	CNPS 4.2	Grassy, moist places in coastal scrub and chaparral. Habitat in Zones 2 and 3.	April – June	Present at Jasper Ridge. Historically reported as near Stanford in Thomas, 1961.
Androsace elongata acuta	California rockjasmine	CNPS List 4.2	Dry grassy slopes. Habitat in Zones 2 and 3.	March – June	Historically reported as occurring at Stanford in Thomas, 1961.
Collinsia multicolor	San Francisco collinsia	CNPS List 1B.2	Moist, shady woodland. Closed cone coniferous forest; coastal scrub, sometimes serpentine. Habitat in limited areas of Zones 1, 2 and 3.	March – May	Historically reported as occurring near Stanford in Thomas, 1961.
Cypripedium montanum	mountain lady's slipper	CNPS List 4.2	Moist areas in mixed-evergreen and coniferous forest. Habitat in Zones 1, 2 and/or 3.	March – August	Historically reported on Corte Madera Creek in Thomas, 1961.
Eryngium aristulatum var. hooveri	Hoover's button-celery	CNPS List 1B.1	Vernal pools. No habitat recorded at Stanford.	July	No records at Stanford. Believed to be extirpated in Santa Clara County.
Fritillaria liliacea	fragrant fritillary	CNPS List 1B.2	Moist areas, often ultramafic, open hills, in valley and foothill grasslands, woodland Habitat in Zones 2 and 3.	February – April	Historically reported as occurring at Stanford in Thomas, 1961.
Leptosiphon (Linanthus) acicularis	bristly linanthus	CNPS List 4.2	Chaparral and coastal prairie. Habitat in Zones 2 and 3.	April – July	Historically reported as occurring at Coal Mine Ridge (Los Trancos) in Thomas, 1961.
Malacothamnus davidsonii	Davidson's bush mallow	CNPS List 1B.2	Slopes and washes. Unlikely to be present. According to the Jepson Manual, this species does not occur in the San Francisco Bay Region.	June – January	One historic record from 1936 in CNDDB from Stanford area. CNPS shows historic records on the Palo Alto, Woodside, and San Mateo quads.
Potamogeton filiformis	slender-leaved pondweed	CNPS List 2.2	Shallow, clear freshwater of lakes and drainage channels, marshes and swamps.	May – July	One record from 1899 in CNDDB from Stanford area. Believed to be extirpated in Santa Clara County, no records in San Mateo County.

Table 4-12. Special-Status Plant Species

Scientific Name	Common Name	Status	Habitat Requirements/ Habitat at Stanford	Flowering Period	Status at Stanford
Micropus (Stylocline) amphibolus	Mt. Diablo cottonseed	CNPS List 3.2	Bare, grassy or rocky slopes. Habitat in zone 3.	March – May	Possibly present at Coyote Hill. Historically reported at Stanford in Thomas, 1961.
Tropidocarpum capparideum	caper-fruited tropidocarpum	CNPS List 1B.1	Alkaline soils, low hills, valley and foothill grassland. Habitat in zone 3.	March – April	Last seen in vicinity of Stanford area in 1957.

Notes: CNPS 1B.1: Rare, threatened or endangered in California and elsewhere and seriously endangered in California (CNPS 2007); Note: "endangered is the CNPS term and does not refer to state or Federal listing status;" 1B.2: rare, threatened or endangered in California and elsewhere and fairly endangered in California. CNPS 2: Rare, threatened or endangered in California, more common elsewhere; CNPS 3: Plants about which we need more information (a review list); 3.2: Plants above which we need more information (a review list); fairly endangered in California. CNPS 4: Plants of limited distribution (a watch list); 4.2: Limited distribution (watch list); fairly endangered in California; 4.3: Limited distribution (watch list); not very endangered in California. J.Thomas, Flora of the Santa Cruz Mountains, 1961.

4.2.3.2 Invertebrates

Although several special-status invertebrates could occur at Stanford (Table 4-13, Special-Status Animal Species), two species of Lepidoptera have been the focus of research efforts by Stanford scientists. These species include the federally listed Threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*), and the Opler's longhorn moth (*Adela oplerella*), which no longer has any special status. Both species occur in habitats on shallow, serpentine-derived soils, which support dwarf plantain (*Plantago erecta*), the Bay checkerspot butterfly's primary larval host plant, and California cream cups (*Platystemon californicus*), the Opler's longhorn moth larval host plant (USFWS 1998). The serpentine grassland habitat at Stanford is within the designated Critical Habitat for the Bay checkerspot butterfly. Although the Bay checkerspot butterfly was historically present in the serpentine grassland at Jasper Ridge, it has not been found there since 1997. The Opler's longhorn moth has not been observed and is not expected, due to the local rarity of its obligatory host plant, California cream cups.

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
Invertebrates				
Calicina (=Sitalcina) minor	Edgewood blind harvestman	This species was petitioned for endangered status in 1993, but was rejected by USFWS (USFWS, 1993).	Serpentine grasslands	Not recorded; habitat is present at Jasper Ridge Biological Preserve.
Euphydryas editha bayensis	Bay checkerspot butterfly	FT	Serpentine grasslands with primary host plant dwarf plantain	Critical Habitat designated at Jasper Ridge Preserve. Species has not been

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			(*Plantego erecta*).	recorded since 1997.
Microcina edgewoodensis	Edgewood Park micro-blind harvestman	This species was petitioned for endangered status in 1993, but was rejected by USFWS (USFWS, 1993).	Serpentine grasslands	Not recorded; habitat is present at Jasper Ridge Biological Preserve.
Neonemobius eurynotus	Berkeley ground cricket	This species was petitioned for endangered status in 1993, but was rejected by USFWS (USFWS, 1993).	Grasslands	Has been identified on Stanford lands.
Speyeria callippe callippe	Callippe silverspot butterfly	FE	Grasslands with host plant *Viola pedunculata* present.	Subspecies range does not include Stanford area. Taxonomically similar species, *Speyeria callippe comstocki*, is present at Stanford.
Herpetofauna				
Thamnophis sirtalis tetrataenia	San Francisco garter snake	FE, SE, CFP	Highly aquatic species found in or near densely vegetated freshwater ponds with adjacent open hillsides where they can bask, feed, and find cover in rodent burrows. Suitable prey limited to ranid frogs (red-legged frog and/or bullfrog.)	Stanford provides suitable habitat for the San Francisco garter snake.
Rana boylii	Foothill yellow-legged frog	CSC	Highly aquatic species in or near rocky streams.	Has not been identified on Stanford lands or vicinity since 1906.
Birds				
Accipiter cooperi	Cooper's hawk	DFG Watch List	Dense canopied evergreen and deciduous forests or in riparian zones. This habitat occurs in Zone 1.	This species has been recorded on Stanford lands, and is expected to be present.

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
Accipiter gentiles	Northern goshawk	CSC	Forages and nests in mature conifer and deciduous forest habitats, with meadows and riparian areas. This habitat occurs in Zone 1.	This species has been recorded on Stanford lands, and is expected to be present only rarely as a vagrant.
Accipiter striatus	Sharp-shinned hawk	DFG Watch List	(Nesting) Ponderosa pine, black oak, riparian deciduous mixed conifer and Jeffrey pine habitats. Prefers riparian areas. This habitat occurs in Zone 1.	This species has been recorded on Stanford lands, and is expected to be present.
Agelaius tricolor	Tricolored blackbird	CSC, BCC	Requires open water, protected nesting substrate such as cattails, and foraging area with insect prey base.	This species has been recorded on Stanford lands, but breeding colonies have not been reported.
Aquila chrysaetos	Golden eagle	DFG Watch List, BCC, CFP	(Nesting and foraging year round) Rolling foothill mountain areas. This habitat occurs in Zones 2 and 3.	This species has been recorded on Stanford lands, and is expected to be present.
Asio flammeus	Short-eared owl	CSC	Forages in open treeless areas such as marshes and grasslands, with elevated sites for perches and dense vegetation for roosting and nesting. This habitat occurs in Zone 3.	This species has been recorded on Stanford lands, and is expected to be present.
Asio otus	Long-eared owl	CSC	Prefers dense riparian, coniferous or live oak woodlands. This habitat occurs in Zone 1.	This species has been recorded on Stanford lands, and though uncommon, is expected to be present.
Athene cunicularia	Burrowing owl	CSC, BCC	Open, dry annual grasslands and scrublands characterized by low-growing vegetation. Dependent upon burrowing mammals, most notably the California ground	This species has not been recorded breeding on Stanford lands since early 1900s. Recent records indicate burrowing owls may utilize areas near Felt Reservoir as wintering habitat.

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			squirrel. Known to occur in Zone 3.	
Buteo regalis	Ferruginous hawk	DFG Watch List, BCC	Forages over open grasslands and agricultural fields. Nests on elevated structures, (trees and human made structures) near open terrain. This habitat occurs in Zone 3.	This species has been recorded in the region, but has not been recorded on Stanford lands.
Buteo swainsoni	Swainson's hawk	ST, BCC	Nests in juniper sage flats, riparian areas, and oak savannah. Forages in adjacent grasslands or agricultural fields. This habitat occurs in Zones 1, 2 and 3.	Species has been observed in Stanford region, but has not been recorded breeding on Stanford lands.
Carduelis lawrencei	Lawrence's goldfinch	BCC	Forages in herbaceous habitats and nests in open oak woodlands, chaparral, and other woodland and scrub habitats. This habitat occurs in Zones 1, 2 and 3.	This species has been recorded on Stanford lands, and is expected to be present.
Chaetura vauxi	Vaux's swift	CSC	Forages over rivers and a variety of habitats. Nests in large tree hollows in redwood and Douglas fir habitats and occasionally in buildings. Habitat occurs in limited portions of Zones 1 and 2.	This species has been recorded on Stanford lands, and is expected to be present.
Circus cyanus	Northern harrier	CSC	Nests on ground in shrubby vegetation, usually at marsh edge nest built of a large mound of sticks in wet areas. May forage in grasslands. Nesting habitat in limited areas of Zone 1; forage habitat in Zone 3.	This species has been recorded on Stanford lands, and is expected to be present.
Coccyzus americanus	Yellow-billed cuckoo	SE, BCC, Candidate for Federal listing	Nests and forages in dense, mature riparian forests and thickets	This species has been recorded in the region, but has not been recorded on

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			along large low elevation streams.	Stanford lands since the early 1900s.
Contopus cooperi	Olive-sided flycatcher	CSC, BCC	Occupies forest and woodland habitats including mixed conifer, Douglas fir and redwood. Habitat occurs in limited areas of Zones 1 and 2 near Jasper Ridge.	This species has been recorded on Stanford lands, and is expected to be present.
Dendroica petechia	Yellow warbler	CSC	Utilizes riparian plant associations. Prefers willows, cottonwoods, aspens, sycamores, and alders for nesting and foraging. Habitat present in Zone 1.	This species has been recorded on Stanford lands, and is expected to be present.
Elanus leucurus	White-tailed kite	CFP	Nests in rolling foothills/valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Forages in open grasslands, meadows or marshes with perching sites. Habitat occurs in Zones 1, 2 and 3.	This species has been recorded on Stanford lands, and is expected to be present.
Empidonax traillii brewsteri	Little willow flycatcher	SE	Forages and nests in dense willow thickets in wet meadows and riparian habitats. Habitat occurs in limited areas of Zone 1.	This species has been recorded in the region, but has not been recorded on Stanford lands.
Ermophila alpestris	California horned lark	DFG Watch List	Utilizes short-grass prairie, bald hills, mountain meadows, open coastal plains, fallow grain fields, alkali flats for foraging and nesting. Habitat occurs on Zone 3.	This species has been recorded on Stanford lands, and is expected to be present.
Falco columbarius	Merlin	DFG Watch List	Forages over open grasslands, wetlands, and forest openings, often near water. Nests in trees and cliffs (does not nest in	This species has been recorded on Stanford lands, and is expected to be present.

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			California). Forage habitat occurs in Zones 1, 2 and 3.	
Falco mexicanus	Prairie falcon	DFG Watch List, BCC	Forages over grasslands and other open terrain. Nests on a sheltered ledge or in old raven or eagle stick nests on cliffs. Forage habitat occurs in Zones 2, 3. Few, if any, ledges and cliffs are present.	This species has been recorded on Stanford lands, and is expected to be present.
Falco peregrinus anatun	Peregrine falcon	SE, CFP, BCC	Uses steep cliffs and buildings for nesting, forages over a variety of habitats, especially wetlands. Forage habitat in Zones 1, 2, 3.	Species has been observed at Stanford, but has not been recorded breeding on Stanford lands.
Geothlypis trichas sinuosa	Saltmarsh common yellowthroat	CSC, BCC	Nests and forages in fresh and saltwater marshes, and seasonal wetlands. Habitat present in limited portions of Zone 1.	This species has been recorded on Stanford lands, and is expected to be present.
Gymnogyps californianus	California condor	FE, SE	Nests and roosts on rock ledges, forages over wide expanses of territory for carrion. Forage habitat most likely to be Zone 3.	This species has been recorded historically on Stanford lands, but has not been observed for several decades. The large home range size of this species, combined with successful recovery programs could remotely result in condors utilizing Stanford lands within the 50-yr term of the HCP.
Icteria virens	Yellow-breasted chat	CSC	Nests and forages within riparian thickets near water. Habitat present in limited areas of Zone 1.	This species has been recorded in the region, but has not been recorded on Stanford lands.
Lanius ludovicianus	Loggerhead shrike	CSC, BCC	Open country with short vegetation such as pastures with fencerows, old orchards, mowed roadsides, agricultural fields, and open woodlands. Breeding	This species has been recorded on Stanford lands, and is expected to be present.

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			habitat occurs in Zone 2 and 3.	
Pandion haliaetus	Osprey	DFG Watch List	Forages over open water for fish primarily. Nests in tall trees or other structures near large water bodies. Suitable habitat occurs in Zone 3 near Felt Reservoir and Lagunita.	This species has been recorded on Stanford lands, and is expected to be present.
Phalacrocorax auritus	Double-crested cormorant	DFG Watch List	Forages for fish over large bodies of water, nests near large bodies of water such as San Francisco bay. Forage habitat in Zone 3. Nesting not expected.	This species has been recorded on Stanford lands, and is expected to be present.
Progne subis	Purple martin	CSC	Occurs in a variety of woodland habitats, typically near water. Suitable habitat in Zones 1, 2.	Historically recorded on Stanford lands. No recent records of this species.
Selaphorus rufus	Rufous hummingbird	BCC	Forages in lowland riparian, open woodlands, scrub, and chaparral. Nests in northern California, north of San Francisco Bay area. May forage in Zones 1 and 2.	This species has been recorded on Stanford lands, and is an uncommon migrant.
Sterna caspia	Caspian tern	BCC	Nests in dense colonies near large water bodies, and forages over open water for fish. Suitable habitat occurs in limited areas of Zones 1 and 3.	This species has been recorded on Stanford lands, and is expected to be present.
Mammals				
Myotis evotis	Long-eared myotis bat	Western Bat Working Group – Medium Priority	Roosts in trees and/or buildings. Fairly common and widespread especially near forests. Suitable habitat occurs in Zones 1 and 2.	This species has been recorded on Stanford lands, and is expected to be present.
Myotis thysanodes	Fringed myotis bat	Western Bat Working Group – High	Uncommon. Found in undisturbed areas; large redwoods,	This species has been recorded on Stanford lands, and is expected to

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
		Priority	chaparral with rocks. Suitable habitat present in limited areas of Zones 1 and 2.	be present.
Myotis volans	Long-legged myotis bat	Western Bat Working Group – High Priority	Uncommon. Found in undisturbed areas; large redwoods, chaparral with rocks. Suitable habitat present in limited areas of Zones 1 and 2.	This species has been recorded on Stanford lands, and is expected to be present.
Myotis yumanensis	Yuma myotis bat	Western Bat Working Group – Low/Medium Priority	Common and widespread along permanent streams, lakes and other waterways. Suitable habitat present in Zones 1 and 2.	Has been recorded on Stanford lands. No known maternity roosting colonies on Stanford lands.
Corynorhinus townsendii townsendii	Townsend's big-eared bat	CSC, Western Bat Working Group – High Priority	Roosts in caves, mines, and large trees and forages within woodlands along stream edges. Suitable habitat in Zones 1 and 2.	Has been recorded on Stanford lands. No known maternity roosting colonies on Stanford lands.
Eumops perotis californicus	Greater western mastiff bat	CSC, Western Bat Working Group – High Priority	Rare in San Francisco Bay area. Roosts in caves and rocky high cliff areas. Suitable habitat in limited areas near Jasper Ridge Biological Preserve.	Has been recorded on Stanford lands. No known maternity roosting colonies on Stanford lands.
Antrozous pallidus	Pallid bat	CSC, Western Bat Working Group – High Priority	Uncommon, especially near urban areas. Roosts in caves and large trees and forages in grasslands and oak savannah. Suitable habitat in portion of Zones 2, 3.	Has been recorded on Stanford lands. No known maternity roosting colonies on Stanford lands.
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat	CSC	Forest and scrub habitats of moderate canopy and moderate dense understory. Suitable habitat present in Zones 1, 2, 3 and 4.	Present and common within scrub and forest communities on Stanford lands.
Bassariscus astutus	Ringtail	CFP	Forages in coniferous forests and riparian woodlands. Nests in	This species is considered uncommon in the region, and has a low potential for

Table 4-13. Special-Status Animal Species

Scientific Name	Common Name	Status	Habitat Requirement	Habitat at Stanford
			tree hollows, rocky outcrops and cliffs. Suitable habitat occurs in Zones 1, 2.	being present on Stanford lands.
Taxidea taxus	American badger	CSC	Rare in western San Francisco Bay area. Grasslands and open stages of forest and scrub habitats with friable soils and good prey base of burrowing rodents. Suitable habitat occurs in Zones 1, 2 and 3.	Has been recorded once in the last decade on Stanford lands.

Notes: FE – Federal endangered; FT – Federal threatened; SE – state endangered; ST – state threatened; CSC – California Species of Special Concern; BCC – Bird of Conservation Concern (Federal)

The callippe silverspot butterfly (*Speyeria callippe callippe*) a federally threatened species, is found on San Bruno Mountain approximately 30 miles north of Stanford. A similar, but unlisted species, Comstock's silverspot (*Speyeria callippe comstocki*) is found at Stanford. Its habitat requirements include grasslands with abundant colonies of its host plant *Viola pedunculata*, nectar plant sources such as thistles and other herbaceous flowers, and hilltops for mating. The habitat requirements for the callippe silverspot and Comstock's silverspot are the same, and these species are separated only by geographic range and taxonomic characteristics.

The current taxonomic status of the overall group of silverspot butterflies is unclear, and previously designated populations of *Speyeria callippe comstocki* are now considered to be *Speyeria callippe callippe* in the north and east San Francisco Bay area. At this time, the subspecies at Stanford is considered to be *Speyeria callippe comstocki*.

With the exception of the Lepidoptera, little is known about the distribution of several potentially special-status invertebrate species in the region surrounding and including Stanford. There are two arachnid species: Edgewood blind harvestman, *(Calicina (=Sitalcina) minor),* and Edgewood Park micro-blind harvestman *(Microcina edgewoodensis).* Both of these species are present at Edgewood County Park and have the potential to be present within the serpentine grasslands at Jasper Ridge. These species have not been detected at this time.

One additional invertebrate species, the Berkeley ground cricket (*Neonemobius eurynotus*), has been recorded at Jasper Ridge, formerly grazed pasture on the lower Stanford foothills, a location near the Stanford Arboretum, and three other localities in the San Francisco Bay area. This species was petitioned for endangered status in 1993, but was rejected by USFWS (USFWS, 1993).

All special-status animal species identified as having some potential for presence on Stanford lands are listed in Table 4-13.

4.2.3.3 Birds

The plant communities on Stanford lands provide suitable habitat for both common and special-status birds. Habitat for special-status bird species on Stanford lands is described in Table 4-13.

Special-status raptors that nest at Stanford on a regular basis include, Cooper's hawk, and white-tailed kite. Those that have some potential to nest on-site include northern harrier, osprey, long-eared owl, short-eared owl, and burrowing owl.

One of the special-status raptors that forages at Stanford on a regular basis is the golden eagle. The golden eagle is a CDFG Species of Special Concern and is fully protected in the State of California (California Department of Fish and Game 2011). It is not federally listed, but is protected under both the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. Sections 668–668d) and the Migratory Bird Treaty Act (MBTA). Rangewide, golden eagles occur in open country (e.g., tundra, open coniferous forest, desert, and barren areas), especially in hills and mountainous regions (American Ornithologists' Union 1998). Golden eagles typically are not found in heavily forested areas or on the immediate coast and are almost never detected in urbanized environments (Grinnell and Miller 1944, Garrett and Dunn 1981). The golden eagle prefers sites that have a favorable nest site, a dependable food supply, and broad expanses of open country for foraging. Hilly or mountainous country that provides updrafts that facilitate takeoff and soaring are occupied more than flat habitats (Johnsgard 1990). In California, golden eagles are often found in open grasslands and oak savannah, but also occupy oak woodland and open shrublands (Hunt et al. 1998). However, golden eagles have not been observed nesting at Stanford for decades (personal communication with Alan Launer, Stanford University, Campus Biologist, January 2012).

Since burrowing owls are highly sensitive to habitat changes and have lost significant habitat in the San Francisco Bay area due to development of lowland grasslands along the bay plain, this species warrants further discussion. Burrowing owls inhabit open, annual and perennial grasslands, deserts and scrublands characterized by low-growing vegetation. They may also occupy woodland habitats where the canopy covers less than 30 percent of the ground surface. Within these habitats, burrowing owls nest in and occupy burrows made by fossorial mammals, particularly those of California ground squirrels. They will also occupy man-made structures including cement culverts; and cement, asphalt, or wood debris piles (CBOC 1993). The grasslands and open areas of oak savannah that support ground squirrel colonies provide suitable habitat for burrowing owls. In addition, the recent creation of wood debris piles to attract fossorial rodents near the new tiger salamander breeding ponds could also provide suitable burrows for burrowing owls in the future.

Burrowing owls have not been recorded nesting at Stanford since the early 1900s (State of California, 2006). Over the last four winters (2005/06 to 2008/09) however, this species was observed near Felt Reservoir and between the Dish and 280, and burrowing owls could be using other portions of Stanford lands as wintering habitat. None have been observed in the spring or early summer breeding season, despite numerous surveys (personal communications with Alan Launer, Stanford University, Campus Biologist, September 2005-2011).

Special-status passerines that potentially nest on-site include loggerhead shrike, California horned lark , little willow flycatcher, Olive-sided flycatcher, rufous hummingbird, Vaux's swift, and yellow warbler. Saltmarsh common yellowthroat is known to nest at Searsville Reservoir.

Additional special-status birds that could occur, but are unlikely to nest at Stanford include double-crested cormorant, Lawrence's goldfinch, tricolored blackbird, yellow-breasted chat, Caspian tern, purple martin, yellow-billed cuckoo, sharp-shinned hawk, ferruginous hawk, merlin, northern goshawk, California condor, Swainson's hawk, ferruginous hawk, peregrine falcon, and prairie falcon.

While only one state Endangered bird species (little willow flycatcher) is considered to have potential to occur on-site, most breeding birds are afforded protection under the CDFG Code (3503 and 3503.5) and the Migratory Bird Treaty Act (MBTA). The MBTA is administered by the USFWS. It establishes seasons and bag limits for hunted species, and renders taking, possession, import, export, transport, sale, purchase, and barter of migratory birds, their occupied nests, and their eggs illegal except when authorized by a Federal permit. CDFG Code prohibits take, possession, or needless destruction of bird nests or eggs. Non-native species including rock doves, European starlings, and European house sparrow are not protected.

4.2.3.4 Mammals

Special-status bats are widely distributed throughout California and roost in a variety of habitats including man-made structures such as mines, bridges, and buildings, and natural habitats such as caves, rock outcrops, and trees. Roost sites provide protection when sleeping, resting between foraging bouts, breeding, nursing, and hibernating. At Stanford, the oak woodland and riparian habitats provide potentially suitable roosting habitat for many species of bats. Roosting sites associated with these habitats include tree snags or live trees supporting cavities, crevices, or exfoliating bark. Some species will also roost directly within the tree foliage. Campus buildings and structures may also provide roosts. Roosting sites in buildings are often found in confined spaces around the outside of the building such as behind hanging tiles, weather boarding, eaves boarding; between roof tiles; or in wall cavities. Habitat for special-status mammal species on Stanford lands is described in Table 4-13.

Tree and building-roosting bats that may occur at Stanford include long-eared myotis, fringed myotis bat, long-legged myotis bat, Yuma myotis bat, Townsend's big-eared bat, greater western mastiff bat, and pallid bat. Additional bat species including California bat, big brown bat, western pipistrelle, and western red bat (also may occur in the HCP area. A number of bat species have been recorded at Stanford including Townsend's big-eared bat and Yuma myotis. More information is provided in Section 2 of the HCP (see EIS Appendix B).

The San Francisco dusky-footed woodrat is a California Species of Special Concern. Woodrats typically occur in forest habitats of moderate canopy and moderate dense understory. They build elaborate nests within these habitats consisting of sticks, bark, plant cuttings, and miscellaneous objects built in a conical pile. This species is known to occur within riparian woodland and chaparral habitat and in residential areas.

Special-status carnivore species that could occur at Stanford include mountain lion, ringtail, and American badger. Mountain lions have been recently recorded throughout Stanford; however ringtail and American badger have not been recorded at Stanford lands for several decades.

4.2.3.5 Special-Status Species Known or Expected in each Management Zone

The Management Zones contain suitable habitat for special-status species, as follows:

- Management Zone 1 provides the riparian habitat used by several bird species of concern for nesting, including Cooper's hawk, sharp-shinned hawk, long-eared owl, and yellow warbler. Mammal species of concern that could be found nesting in Management Zone 1 include San Francisco dusky-footed woodrat, ringtail, and bats (long-eared myotis, Yuma myotis, and Townsend's big-eared bat). Plant species of concern include western leatherwood, Gairdner's yampah, and San Francisco collinsia. Management Zone 1 at Lagunita and in the adjoining foothills provides habitat for golden eagle, short-eared owl, burrowing owl, Lawrence's goldfinch, white-tailed kite, California horned-lark, osprey, double-crested cormorant, Franciscan onion, and fragrant fritillary;

- Management Zone 2 provides the riparian woodland and grassland habitat that could provide suitable nesting habitat for the species listed in Management Zone 1. Additionally, Zone 2 areas provide the grassland and oak savannah habitat that is suitable foraging habitat for golden eagles. The plants include those listed for Management Zone 1 plus Franciscan onion and fragrant fritillary;
- Management Zone 3 provides the grassland and oak savannah habitat that could provide suitable nest sites for golden eagle, short-eared owl, burrowing owl, Lawrence's goldfinch, white-tailed kite, California horned-lark, loggerhead shrike, osprey, and double-crested cormorant. Additionally, Zone 3 areas provide the grassland and oak savannah habitat that is suitable foraging habitat for golden eagles. Plant species include Franciscan onion and fragrant fritillary.

4.3 SOCIOECONOMIC ENVIRONMENT

Under NEPA, the social and economic effects that are related to effects on the natural or physical environment must be considered in the EIS.

4.3.1 Socioeconomic Setting

4.3.1.1 Employment at Stanford

Stanford University is a large employer on the peninsula. In 2005, Stanford employed 9,159 staff members including 4,118 managerial and professional staff, 2,762 clerical and technical staff, and 737 service and maintenance staff. SLAC National Accelerator Laboratory employs an additional 1,467 employees (Stanford, 2006). In addition, the major leased uses (Stanford Shopping Center, Stanford Research Park) employ a few thousand people who live in the surrounding community.

4.3.1.2 Housing in the Stanford Area

According to the Stanford Community Plan Housing Element, Stanford students, faculty, and staff who seek housing in the Stanford area encounter high housing costs and relatively few housing units available for sale or for rent. The Stanford area is one of the most desirable and in-demand locations in the Bay Area.

The incomes and wealth creation associated with the high technology industries in the area have resulted in unprecedented ability and willingness to pay what the market will bear for housing prices in these highly desirable communities. Scarcity of housing, prosperity, and desirability has been and will continue to be potent factors in the housing situation for the Stanford area.

There are currently two main types of housing on the Stanford campus: student housing and faculty/staff housing. Housing for both undergraduate and graduate students is located near the center of campus, since several Stanford programs extend into the residential setting. Currently, Stanford provides approximately 5,900 units of undergraduate housing and 3,860 units of graduate student housing.

The student housing is comprised of dormitories and apartments. Undergraduates primarily live in dormitories, and typically remain on campus only during the academic year. Graduate student housing is mostly concentrated on the east side of campus in the 3,200-person Escondido Village. Graduate students live primarily in apartments, and often occupy their apartments year-round for multiple years while obtaining a degree.

On-campus housing opportunities are also available to active faculty, retired faculty, surviving faculty spouses, and senior staff. Currently, 989 on-campus units are available to faculty and staff. Most of these homes are on long-term ground leases, whereby the occupants lease the land from Stanford but own the home itself. Twenty-five percent of these homes are multiple-family dwellings, 3 percent are attached townhomes, and the remainder is single-family homes.

Under an existing General Use Permit issued by Santa Clara County, Stanford can add up to 3,018 housing units. The County's Community Plan identifies locations for residential development that would allow between 2,655 and 3,022 additional housing units to be constructed on Stanford land over the 10-year period of the current General Use Permit. Most of these housing units would be located in Management Zone 4.

According to Santa Clara County's Community Plan for Stanford lands (page 39), housing is a countywide issue of concern that has taken on particular importance in the northern portion of Santa Clara County, where Stanford University is located:

- *The University has a large population of graduate students with very limited incomes who are at a severe disadvantage in the local rental market. Hospital residents and postdoctoral fellows also have incomes substantially lower than the area's median income.*
- *Faculty and staff must compete for rental and ownership housing with other area residents. Unlike other Santa Clara County industries, where an individual employer is likely to compete with other local employers for workers, Stanford is competing for its faculty and staff with other universities which are generally located in areas with more affordable housing markets. Stanford considers the housing market as a primary obstacle in its recruiting and retention efforts for graduate students, faculty and staff.*
- *Students, faculty, and administrative staff must often commute very long distances to their classes and jobs at Stanford if they cannot find affordable housing close to the campus.*

In the century since its inception, Stanford University has taken steps to address the housing needs of its students and faculty many times, due to the limitations of the housing market and Stanford's nature as a residential university. However, as housing supply and affordability trends within Santa Clara County and the Stanford area worsen, it is in the interest of both Stanford University and the public to ensure balance between housing demand and supply as it pertains to Stanford University's development.

Stanford lands represent one of the most important opportunities in the County to improve the balance between jobs and housing, due to the potential to provide housing on Stanford lands for designated populations. While this housing is directly accessible only to Stanford students, faculty and staff, it also benefits the wider community by augmenting the local housing supply. To that end, development of additional housing on the campus is a fundamental policy direction of this Community Plan.

4.3.1.3 Income Producing Revenues at Stanford

The financial performance of Stanford enables it to advance the mission of teaching and research. The following FY 2006 financial growth results were reported to the Stanford University Board of Trustees on December 11, 2006. Stanford University reported growth of 9 percent in both revenues and expenses in fiscal year 2006 (FY 2006), which ended Aug. 31.

Revenues come from various sources; one source is the commercial, industrial, and equestrian/agricultural leaseholds on Stanford lands. The revenues generated by these sources also contribute to the County's tax base, and to the economy of the two counties and nearby cities.

Despite Stanford's strong financial performance, it has identified continued financial challenges. Currently these include the tightening of federally sponsored research funding, the ability to attract and retain top faculty and senior staff by providing affordable housing, and the need to renovate and invest in new facilities.

While most of the commercial and industrial leaseholds are contained within Zone 4, almost all of the equestrian/agricultural leaseholds are located within Zones 1, 2 and 3.

4.4 ENVIRONMENTAL JUSTICE

According to the Federal Council on Environmental Quality's guidance, Executive Order 12898 requires Federal agencies to consider the composition of the affected area to determine whether minority populations or low-income populations are present, and if so whether there may be disproportionately high and adverse effects on those populations compared with the general population. Minority and low-income populations as they apply to environmental justice are defined as:

- Black - a person having origins in any of the black racial groups of Africa.
- Hispanic - a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
- Asian American - a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.
- American Indian and Alaskan Native - a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or recognition.
- Low-Income - a person whose household income (or, in the case of a community or group, whose median household income) is at or below the U.S. Department of Health and Human Services poverty guidelines.

To determine whether a proposed action is likely to have disproportionately high and adverse effects, agencies must identify a geographic scale for which they will obtain demographic information. This is identified as the "Region of Influence" (ROI). For this EIS the ROI includes Santa Clara and San Mateo counties because Stanford is located within both of these counties.

According to the 2000 Census, the racial makeup of Santa Clara County was approximately 53 percent White, 25 percent Asian American, 2.80 percent Black, less than one percent American Indian, and 24 percent of the population identified themselves as Hispanic of any race.

The racial makeup of San Mateo County according to the 2000 census was approximately 59 percent White, 20 percent Asian American, 3.5 percent Black, less than one percent American Indian, and 21.88 percent of the population were Hispanic of any race.

Both of the counties have a higher population of Asian Americans than the statewide average, which in 2004 was estimated to be 12.1 percent. Both of the counties had fewer Hispanic and

Black populations than the 2004 estimated statewide averages of 34.7 percent (Hispanic) and 6.8 percent (Black).

Income levels within the ROI are significantly higher than the California or U.S. average, and poverty levels are significantly lower. The median household income within the ROI exceeded $85,000 in 2004 (State of California Franchise Tax Board, 2006), and according to the 2000 U.S. Census, 7.5 percent of the population in Santa Clara County and 5.8 percent of the population in San Mateo County lives below the poverty line. This figure contrasts with figures for the U.S. population which had a median household income of $41,648 with 12.7 percent of the population living below the poverty line as of 2004, and the statewide population which had a median household income level of $48,440 with 13.8 percent of the state's population living below the poverty line as of 2003.

4.5 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are property interests held in trust by the United States for the benefit of Indian tribes or individuals. Indian reservations, rancherias, and public domain allotments are common ITAs. The land associated with these ITAs, as well as the resources within the boundaries, such as trees, minerals, oil, and gas, are also considered trust assets. Other ITAs include traditional-use areas and fishery resources. Hunting and fishing rights may be ITAs, although in California, fishing and hunting are regulated by the CDFG, both on and off reservations. Types of actions which could affect ITAs include an interference with the exercise of a reserved water right, degradation of water quality where there is a water right, impacts to fish and wildlife where there are hunting or fishing rights, or noise near a land asset that adversely impacts uses of the reserved land.

There are no ITAs within Stanford University, immediately adjacent to Stanford or downstream from Stanford between Stanford lands and the San Francisco Bay. The closest Rancherias were in the east bay (Niles and Sunol). Native American individuals owned some large tracts in the Moffett Field, Milpitas and Coyote Point areas at the turn of the century, and there are a few trust lands in Hollister.

This page intentionally left blank.

Stanford University HCP
Environmental Impact Statement

Figure 4-1 Geologic Hazards

Boundary of Stanford Lands

Liquefaction

Areas where historical occurence of liquefaction or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required

Earthquake-Induced Landslides

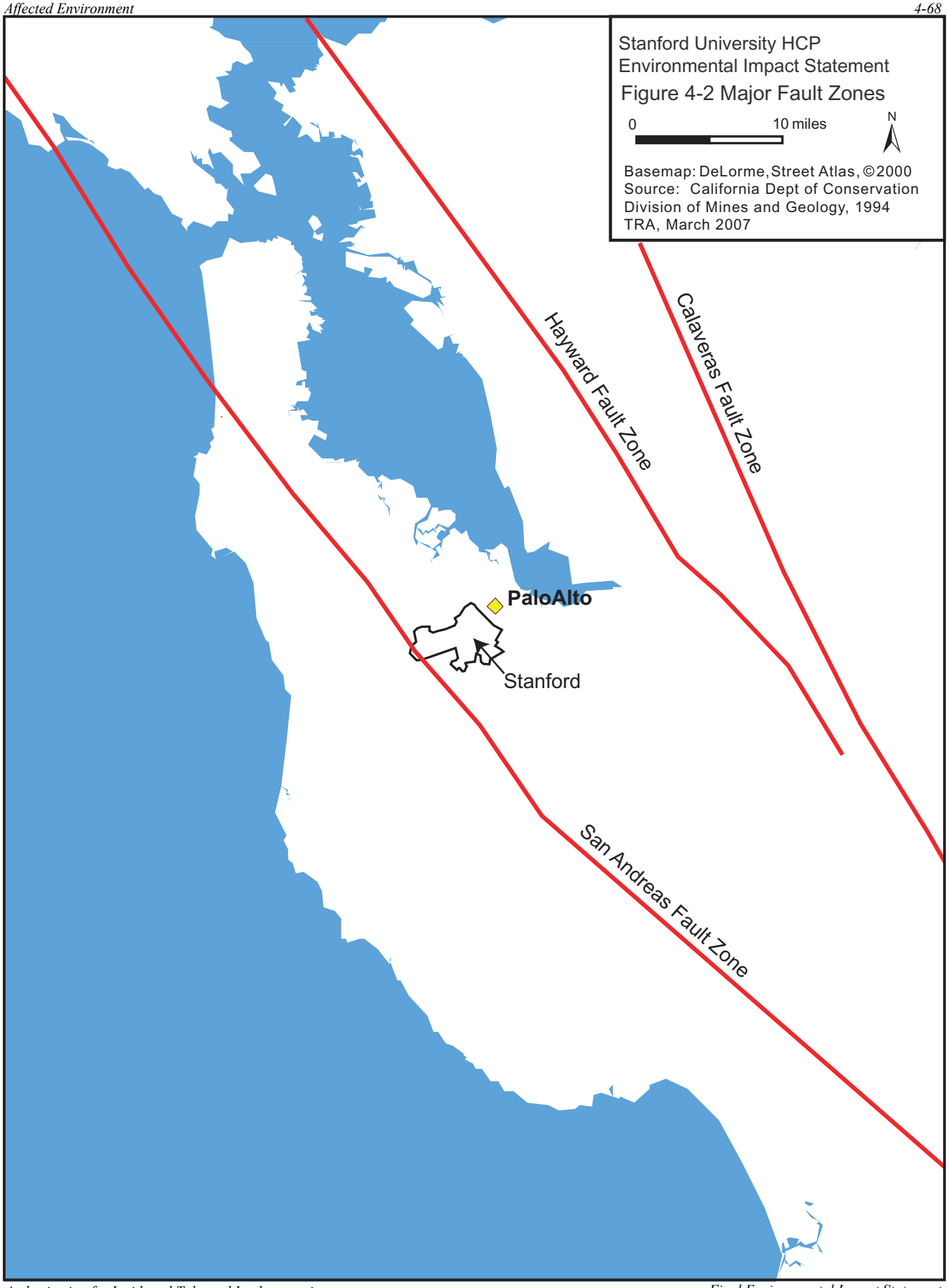
Areas where previous occurence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

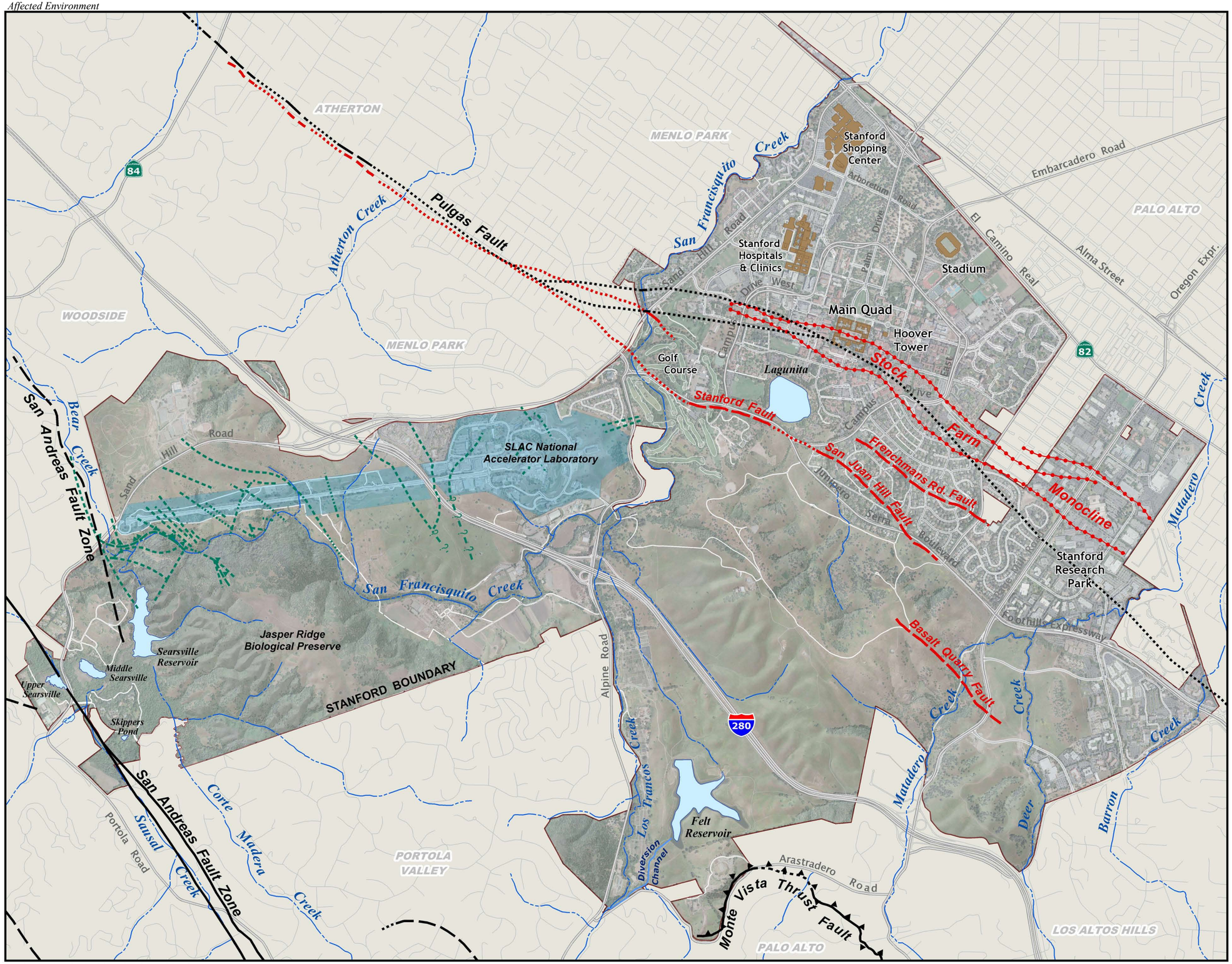
Note: Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local/building planning department for information regarding the location of such mitigated areas.

N

0 1 Mile

Source: www.conservation.ca.gov/cgs, Seismic Hazard Zones, Palo Alto Quadrangle, October 8, 2006
TRA, March 2007


Stanford University HCP
Environmental Impact Statement
Figure 4-2 Major Fault Zones
0
10 miles
N
Basemap: DeLorme, Street Atlas, ©2000
Source: California Dept of Conservation
Division of Mines and Geology, 1994
TRA, March 2007
Hayward Fault Zone
Calaveras Fault Zone
San Andreas Fault Zone
PaloAlto
Stanford



Stanford University HCP Environmental Impact Statement

Geologic Faults

USGS, named faults only

- Fault, certain
- Fault, approx. located
- Fault, concealed
- Thrust fault, approx.
- Thrust fault, concealed

Dames & Moore

- Faults
- Faults - Concealed
- Faults - Inferred
- Monocline

SLAC Hydrogeologic Review

- Concealed
- Indefinate or Inferred
- Uncertain
- Upper Plate of Low Angle Thrust Fault

Sources:

1. *U.S. Geological Survey, Palo Alto 30' x 60' Quadrangle Geologic Map Profiles, Source scale 1:100,000 Publication date: 2000, Issue ID: 2332*
2. *Dames & Moore, 1997, "The Stock Farm Monocline"*
3. *Hydrogeologic Review Stanford Linear Accelerator Center Prepared by: ESA Consultants (ESA# 117.9001) Date: February, 1994 (SLAC-1-750-2A15H-002)*

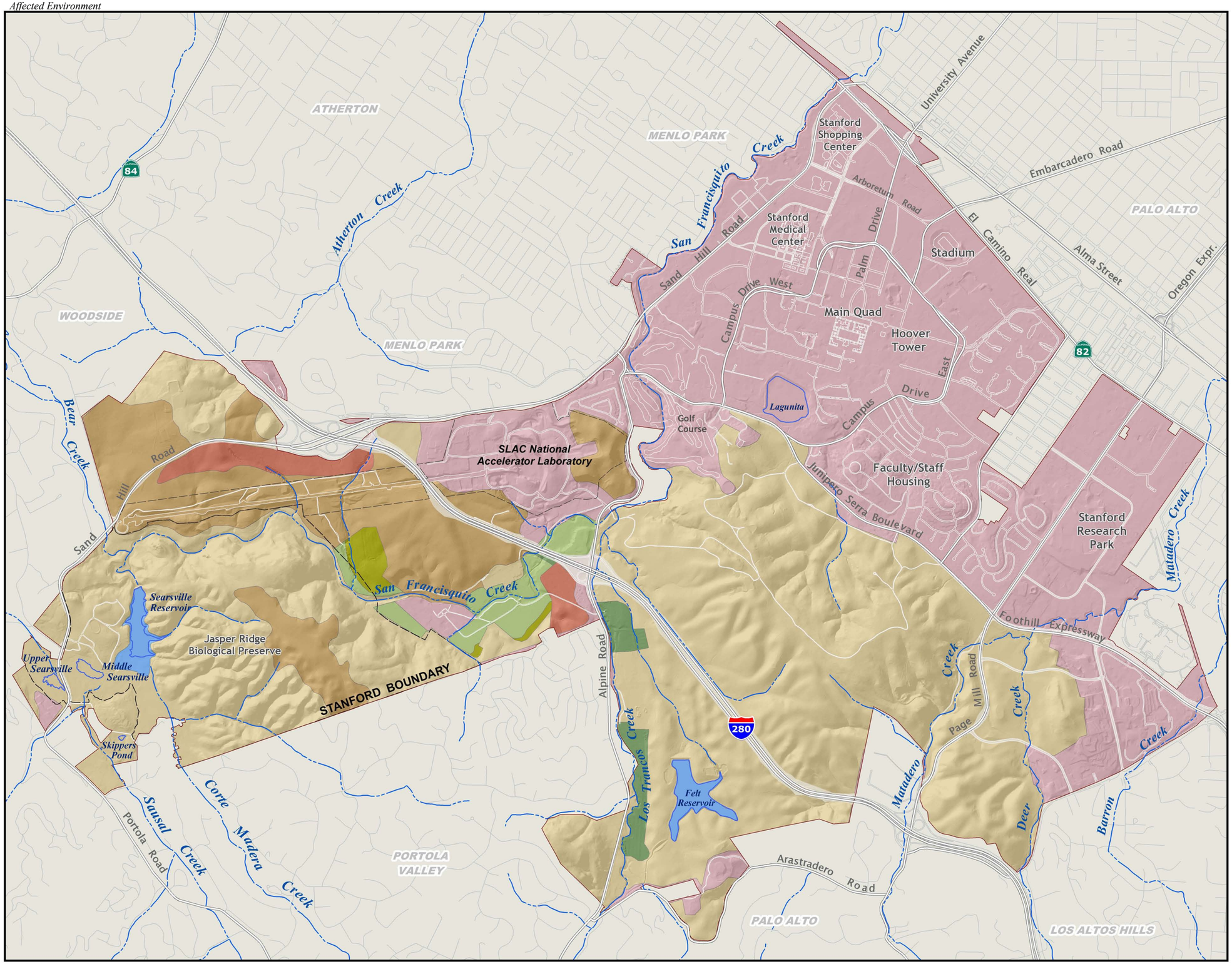
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-3



Stanford University HCP Environmental Impact Statement

Farmland

- Prime
- Statewide Importance
- Unique
- Local Importance
- Grazing
- Urban
- Water
- Not Farmland

hectare

100
25
4
acres

Sources:
CA Department of Conservation, 2004
Creeks: US Geological Survey, 1991

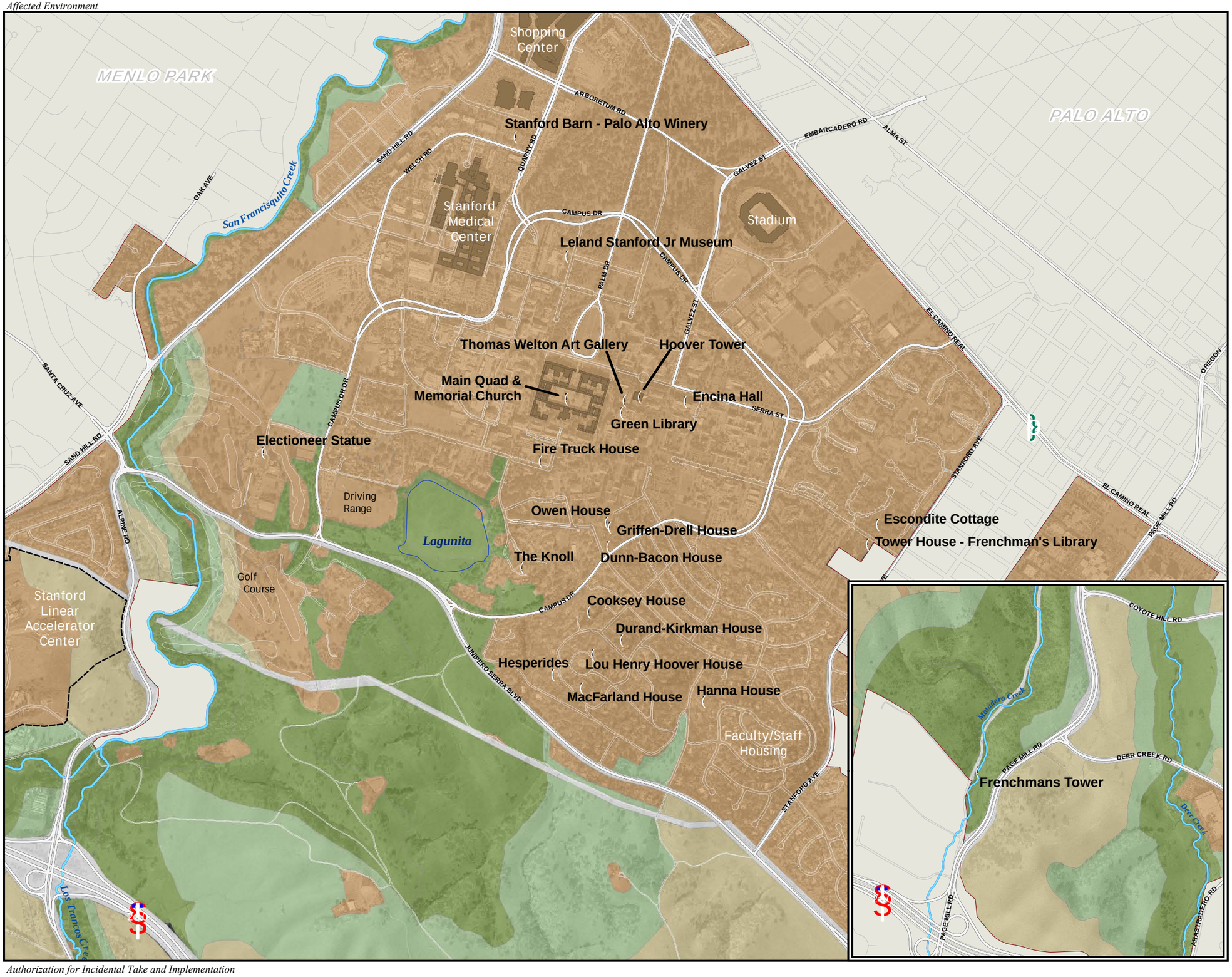
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-4



Stanford University HCP Environmental Impact Statement

Historic Resources Inventory with Management Zones

- Historic Resource
- Zone 1
- Zone 2
- Zone 3
- Zone 4

hectare

100
25
4

acres

Sources:
Historic Resources: Santa Clara County, 2006
HCP Zones: Stanford University Campus Biologist, 2006
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.25 Miles

0 0.25 0.5
Miles

Stanford University Land Use & Env. Planning
Date Printed: July 30, 2009

Figure 4-5

Figure 4-6. San Francisquito Creek Hydrograph

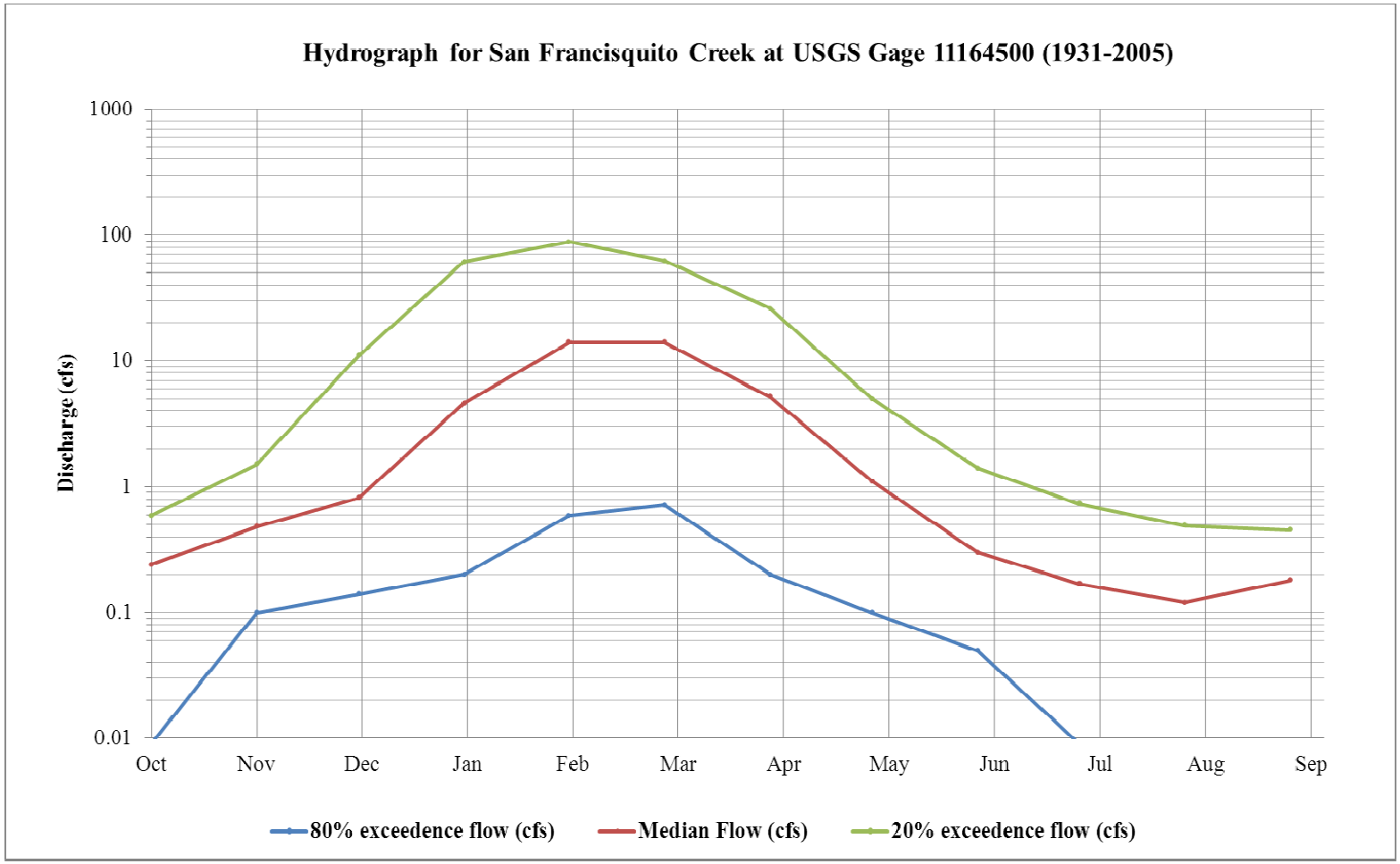


Figure 4-7. Average Annual Forecasted Emissions

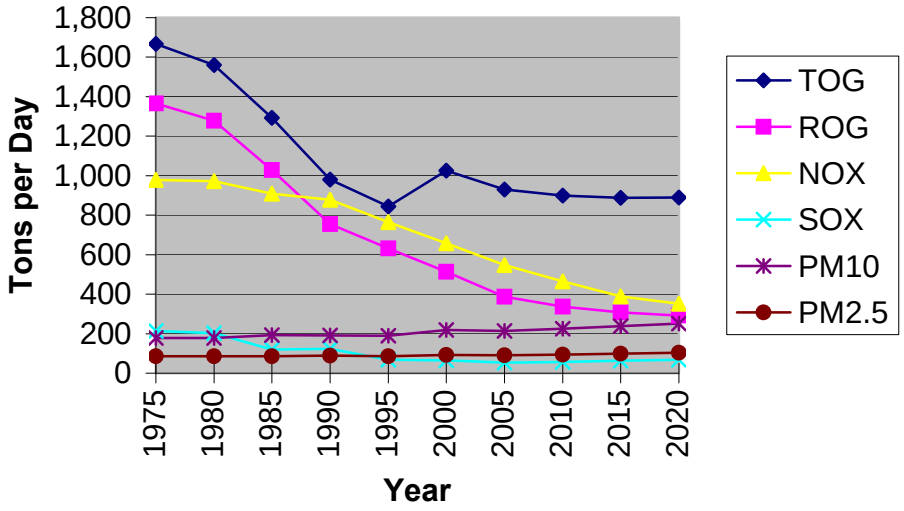
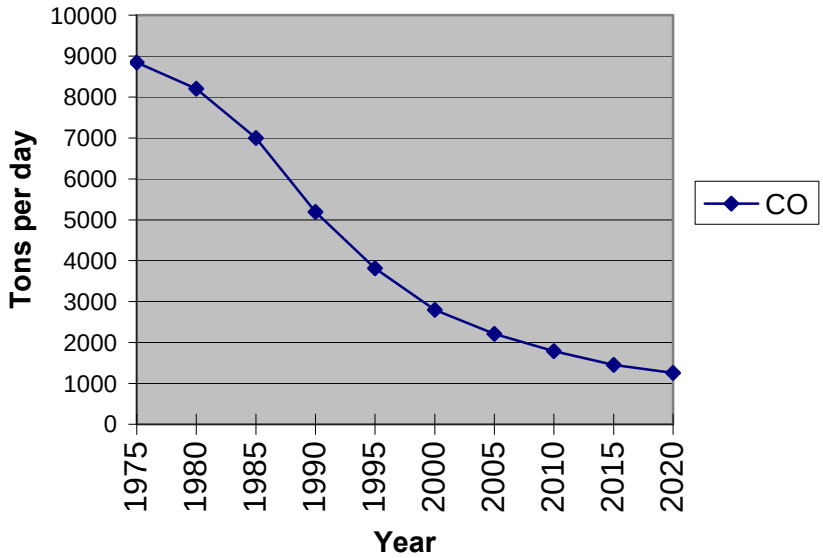
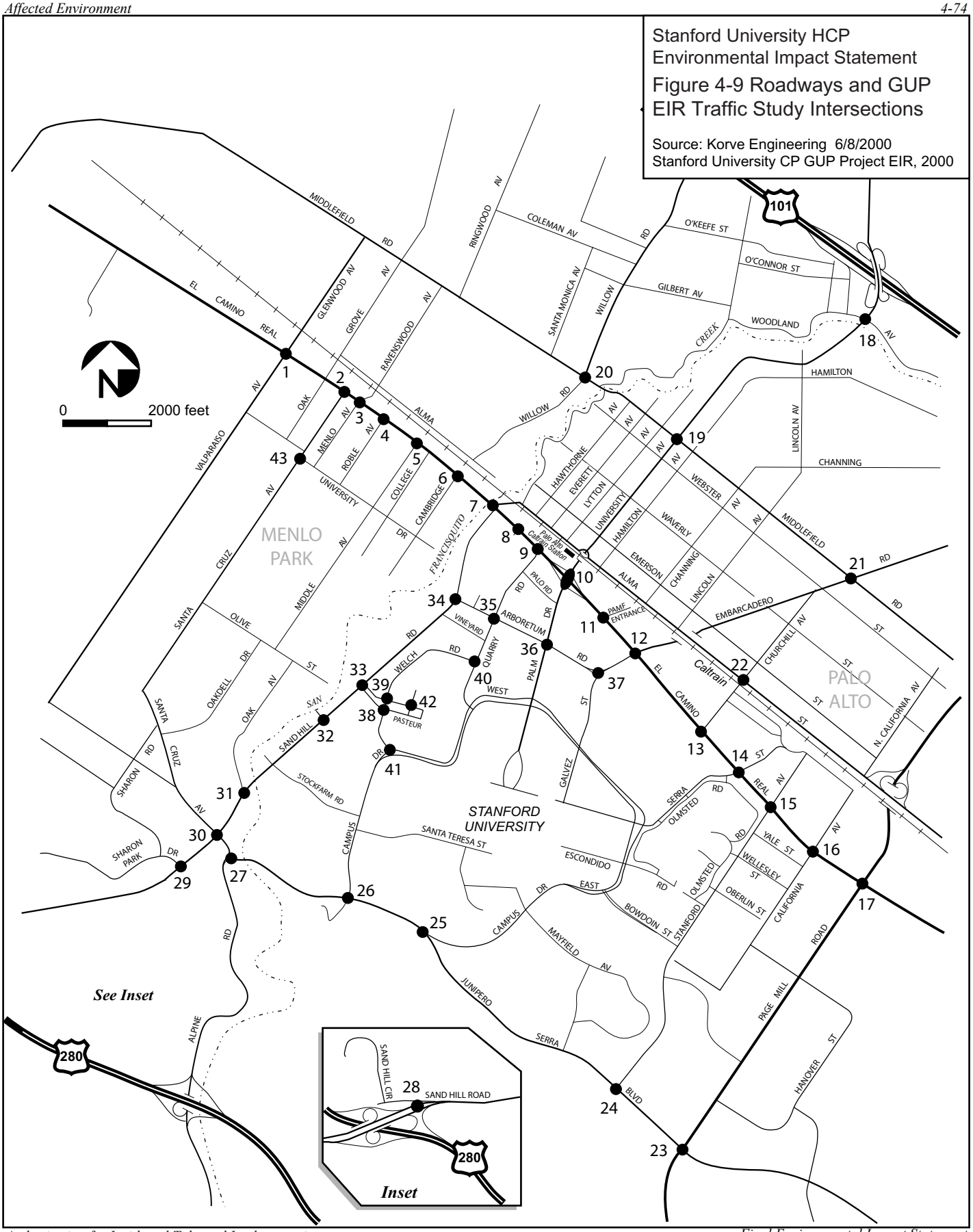


Figure 4-8. Annual Average CO Emissions

Past, Current, and Forecasted




Stanford University HCP
Environmental Impact Statement
Figure 4-9 Roadways and GUP
EIR Traffic Study Intersections
Source: Korve Engineering 6/8/2000
Stanford University CP GUP Project EIR, 2000
0
2000 feet
MENLO PARK
PALO ALTO
STANFORD UNIVERSITY
Caltrain
Palo Alto Caltrain Station
PAMF ENTRANCE
ARBORETUM
See Inset
Inset
SAND HILL ROAD
MIDDLEFIELD RD
EL CAMINO REAL
GLENWOOD AV
GROVE AV
RAVENSWOOD AV
RINGWOOD AV
COLEMAN AV
SANTA MONICA AV
WILLOW RD
O'KEEFE ST
O'CONNOR ST
GILBERT AV
WOODLAND AV
CREEK
HAMILTON
LINCOLN AV
CHANNING
101
280
VALPARAISO AV
OAK GROVE AV
MENLO AV
ROBLE AV
UNIVERSITY
COLLEGE
CAMBRIDGE
ALMA
HAWTHORNE
EVERETT
LYTTON
UNIVERSITY
HAMILTON
WAVERLY
WEBSTER
MIDDLEFIELD RD
EMERSON
CHANNING
LINCOLN
EMBARCADERO RD
CHURCHILL AV
N. CALIFORNIA AV
SANTA CRUZ AV
MIDDLE AV
OLIVE
OAKDELL DR
OAK GROVE AV
SAN ANTONIO
SAND HILL
SANTA CRUZ AV
SHARON RD
SHARON PARK DR
FRANCISQUITO
PALO ALTO RD
VINEYARD
WELCH RD
QUARRY
PALM DR
WEST PALM DR
PASTEUR
STOCKFARM RD
GALVEZ ST
SERRA ST
OLMSTED RD
REAL AV
YALE ST
WELLESLEY ST
OBERLIN ST
CALIFORNIA AVE
STANFORD
BOWDOIN ST
CAMPUS DR EAST
CAMPUS DR
SANTA TERESA ST
ESCONDIDO RD
MAYFIELD AV
JUNIPERO SERRA BLVD
PAGE MILL ROAD
HANOVER ST
ALPINE RD
SAND HILL CIR
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

Stanford University HCP Environmental Impact Statement

Water Diversions & Creek Monitoring Facilities

- Creek Monitoring Facility
- US Geological Survey Stream Gaging Station
- Diversion
- Waterbody
- Watershed Boundary
- Additional San Francisquito Creek basin area connected via storm drainage system

hectare

100
25
4
acres

Sources:
Stream Monitoring Facilities: SU/PO, 2004
Detention Ponds: SU/PO, 2004
Diversions: SU/PO, 2004
Watershed: Nolte, 1999 and SU/PO, 2004
Additional S.F. Creek drainage: Nolte, 1999
Gaging Stations: US Geological Survey, 1991
Creeks: US Geological Survey, 1991

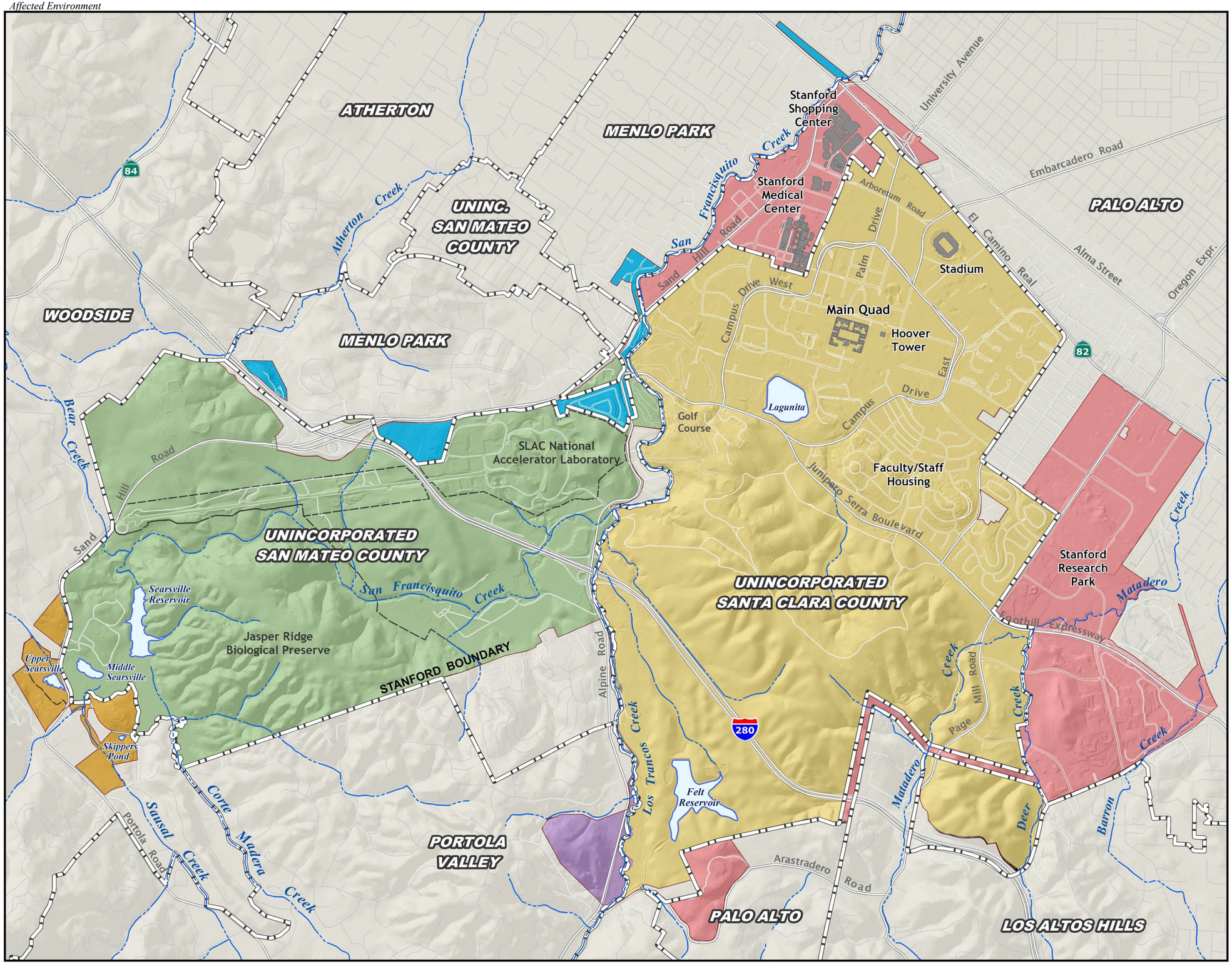
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-10



Stanford University HCP Environmental Impact Statement

Governmental Jurisdictions

- City of Menlo Park
- City of Palo Alto
- Town of Portola Valley
- Town of Woodside
- San Mateo County
- Santa Clara County
- Government Jurisdiction

hectare

100
25
4
acres

Sources:
Jurisdictions: Stanford University Planning Office, 2004
Creeks: US Geological Survey, 1991

Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-11

Stanford University HCP Environmental Impact Statement

Existing Land Use in Habitat Management Zones

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Existing Land Use

AC: Academic
AR: Academic Reserve
BP: Biological Preserve
CM: Commercial
IN: Institutional
OS: Open Space
RC: Recreation
RS: Residential

hectare
100
25
4
acres

Sources:
HCP Zones: Stanford University Campus Biologist, 2006
Existing Land Use: Stanford Univ. Planning Office, 2004
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

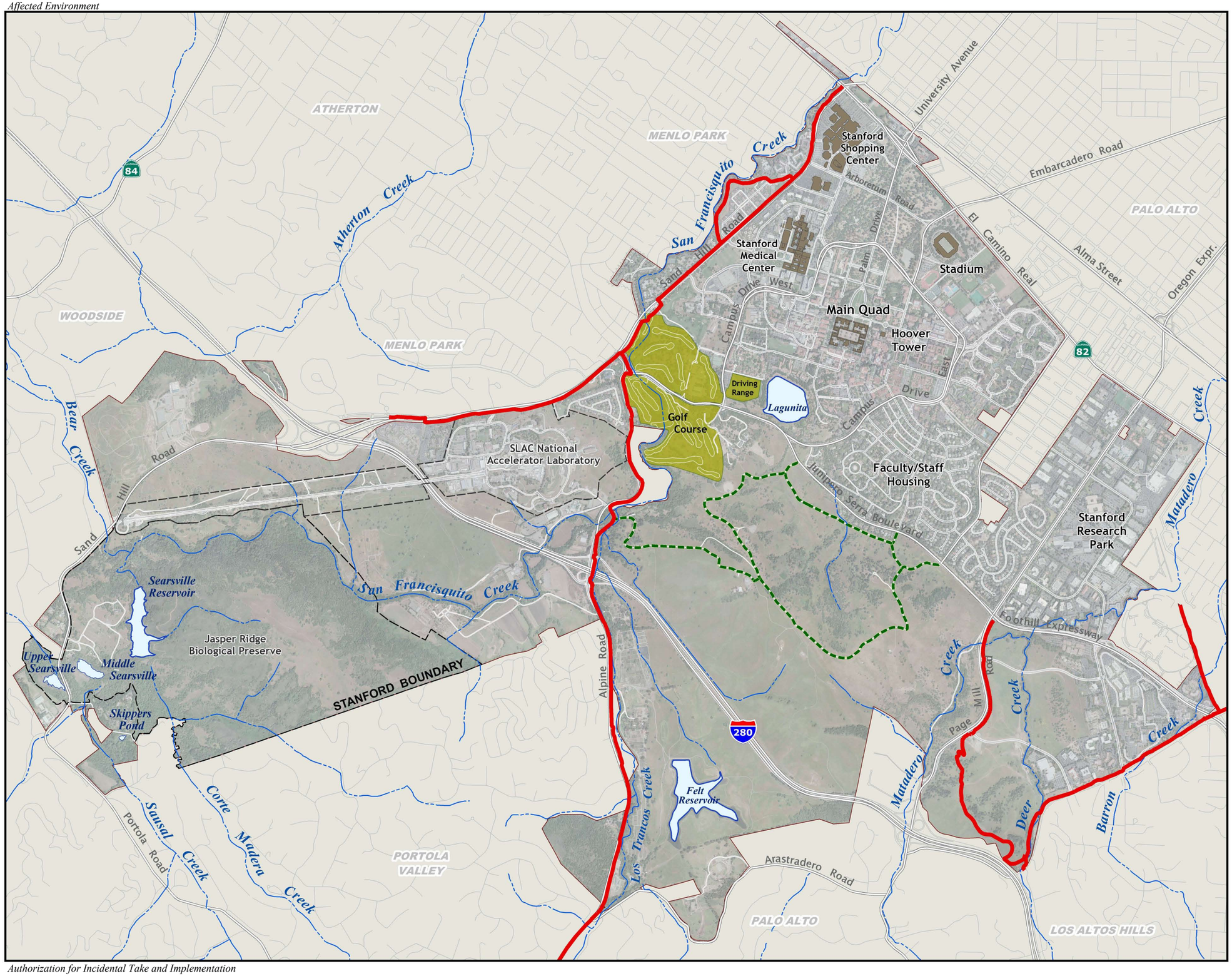
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-12



Stanford University HCP Environmental Impact Statement

Recreational Uses

- "Dish" Recreational Route
- Public Trail
- Golf Course

hectare

100
25
4
acres

Sources:
Public Trails:
Santa Clara Co. Trails Master Plan Update, Nov. 14, 1995
San Mateo Co. Trails Plan, Draft Program EIR, Oct. 1999
Creeks: US Geological Survey, 1991

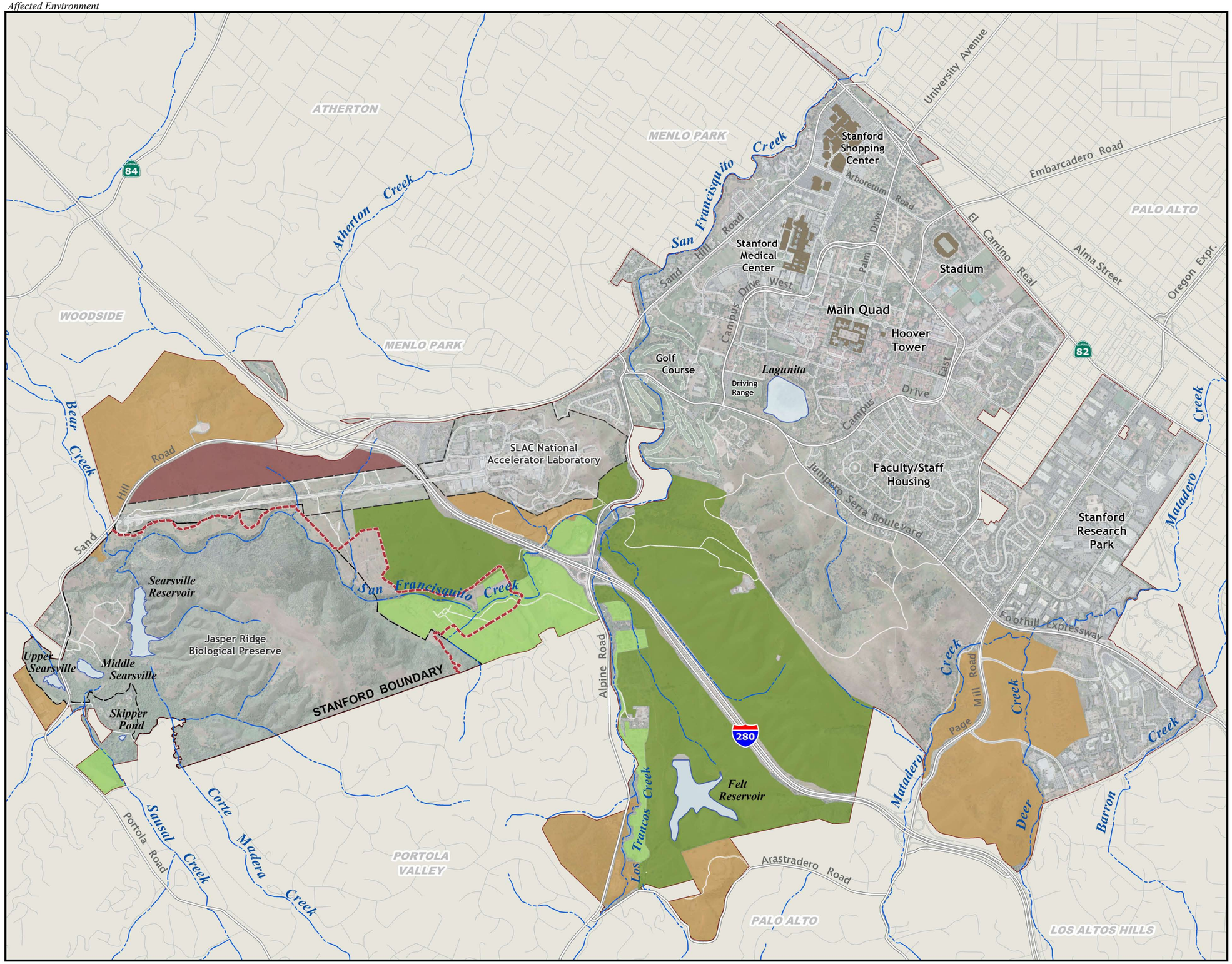
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-13



Stanford University HCP Environmental Impact Statement

Leaseholds: Agricultural & Equestrian

- Agriculture
- Equestrian
- Equestrian Trail
- Grazing
- Vacant

hectare
100
25
4
acres

Sources:
Leases: Stanford Management Co. & SU/PO, 2006
Creeks: US Geological Survey, 1991

Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-14

Stanford University HCP Environmental Impact Statement

Leaseholds: Commercial/ Institutional

- Commercial
- Institutional/ Professional
- Residential
- SLAC

hectare
100
25
4
acres

Sources:
Leases: Stanford Management Company & SU/PO, 2006
Creeks: US Geological Survey, 1991

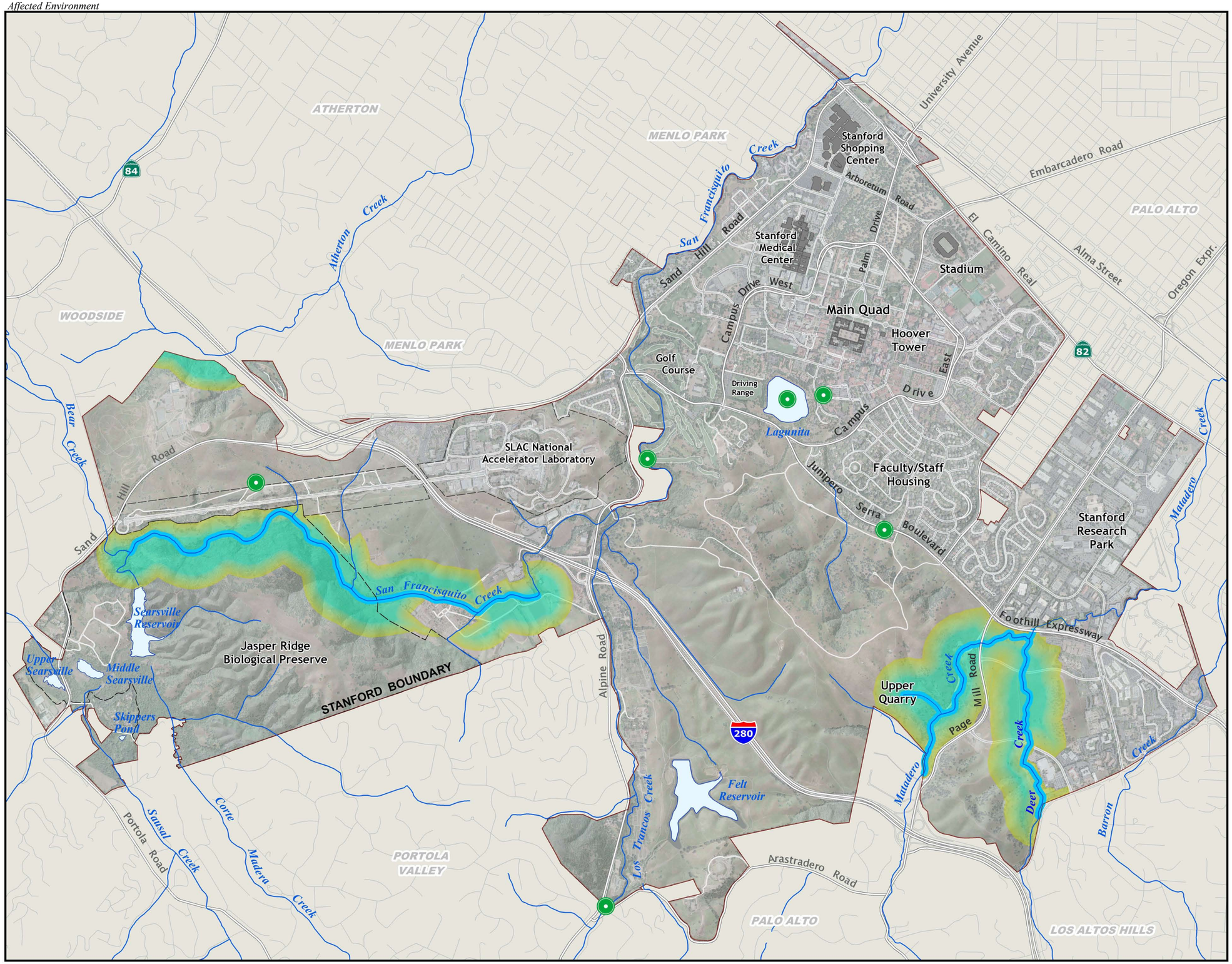
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-15



Stanford University HCP Environmental Impact Statement

California Red-Legged Frog at Stanford

- Occupied Creek (Creek widths exaggerated)
- Associated Uplands
- Outliers / Historical Records

hectare
100
25
4
acres

Sources:
CRLF habitat: Stanford Unv. Campus Biologist, 2006
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

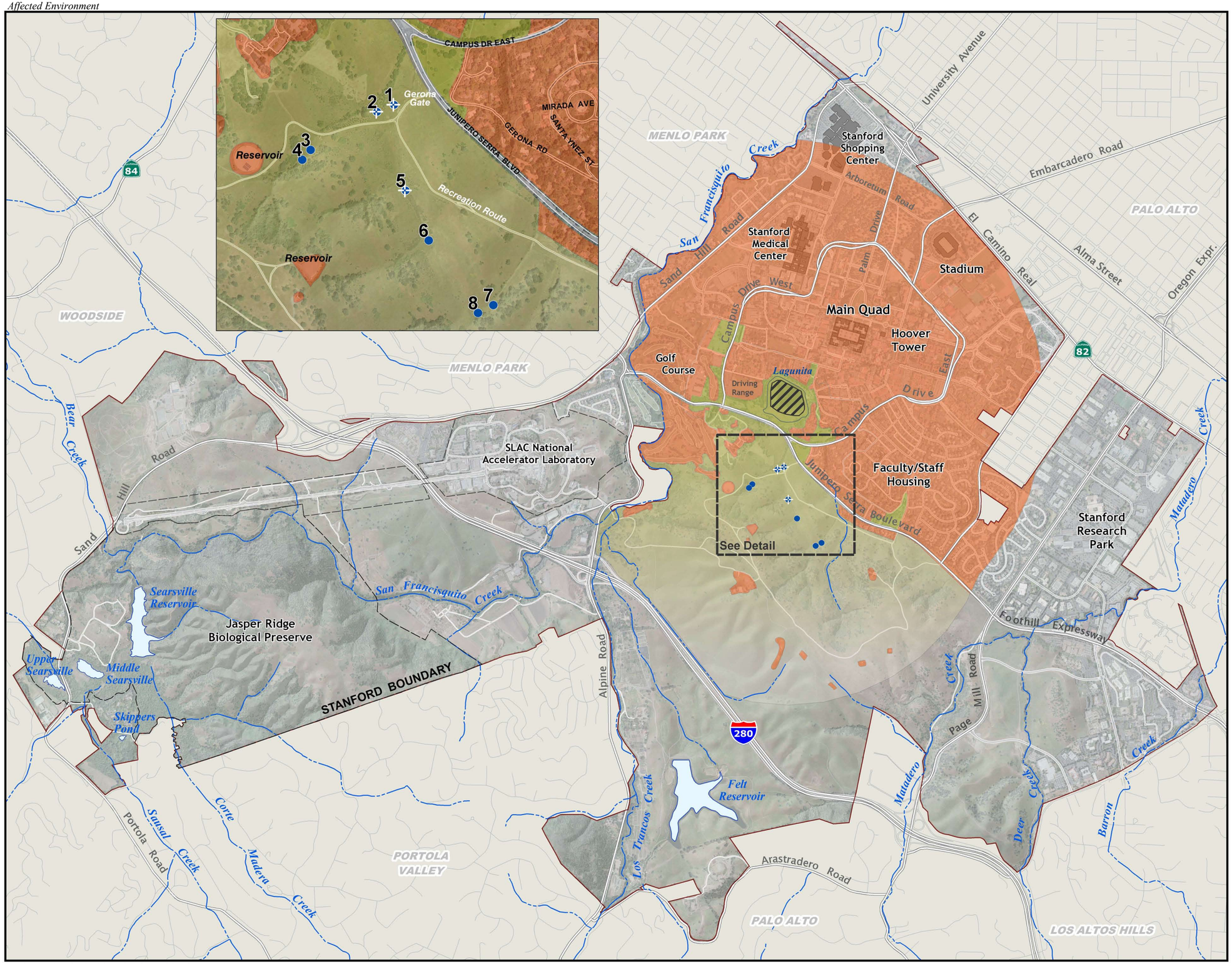
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-16



Stanford University HCP Environmental Impact Statement

California Tiger Salamander at Stanford

- Recent Breeding Locations
- Occupied Undeveloped Lands
- Population Sinks
- Recently Established Pond

hectare

100
25
4
acres

Sources:
CTS habitat: Stanford Univ. Campus Biologist, 2006
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

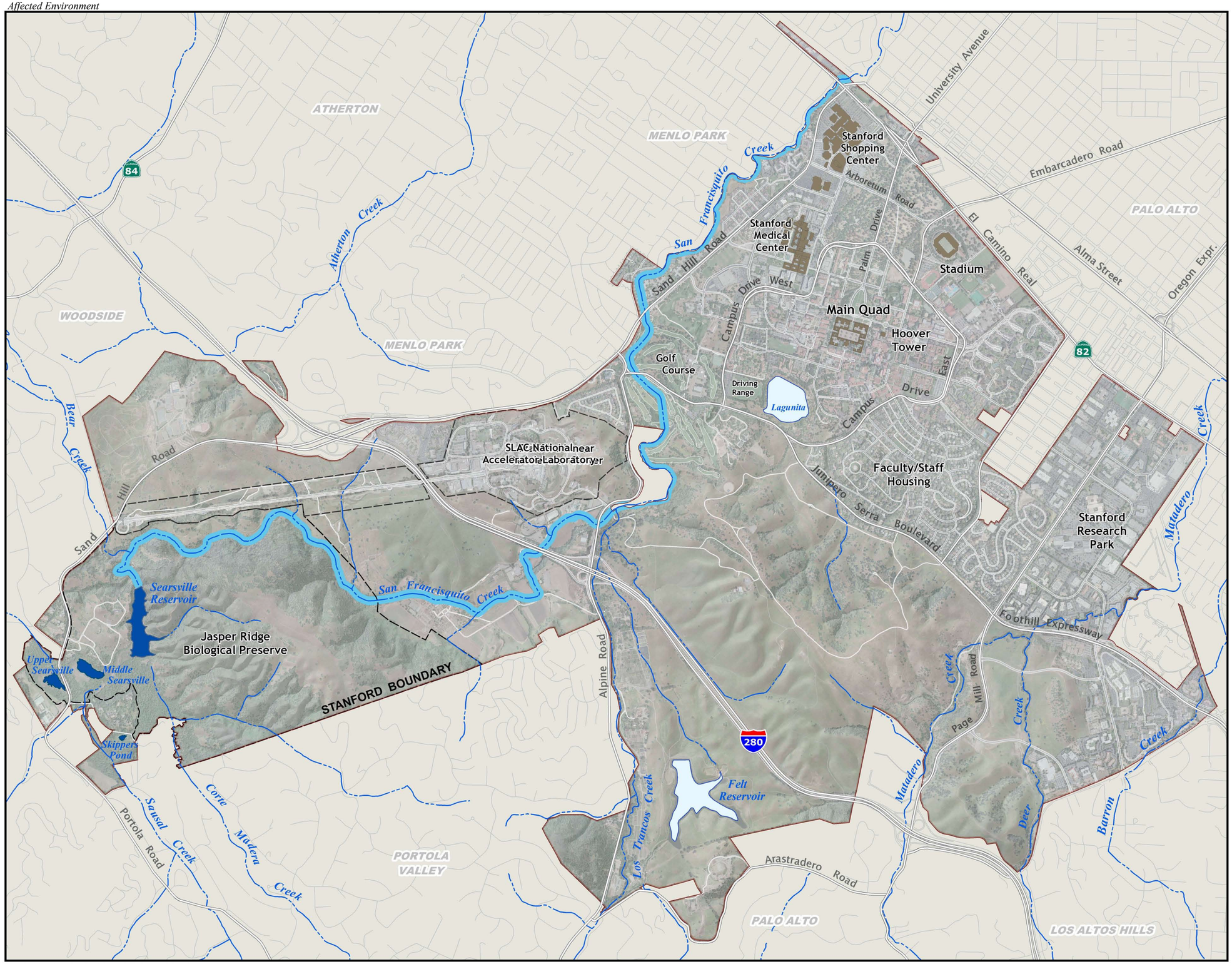
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-17



Stanford University HCP Environmental Impact Statement

Western Pond Turtle at Stanford

Recently Occupied Creek
(Creek width exaggerated)

Recently Occupied Reservoir

hectare
100
25
4
acres

Sources:
WPT habitat: Stanford Unv. Campus Biologist, 2006
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

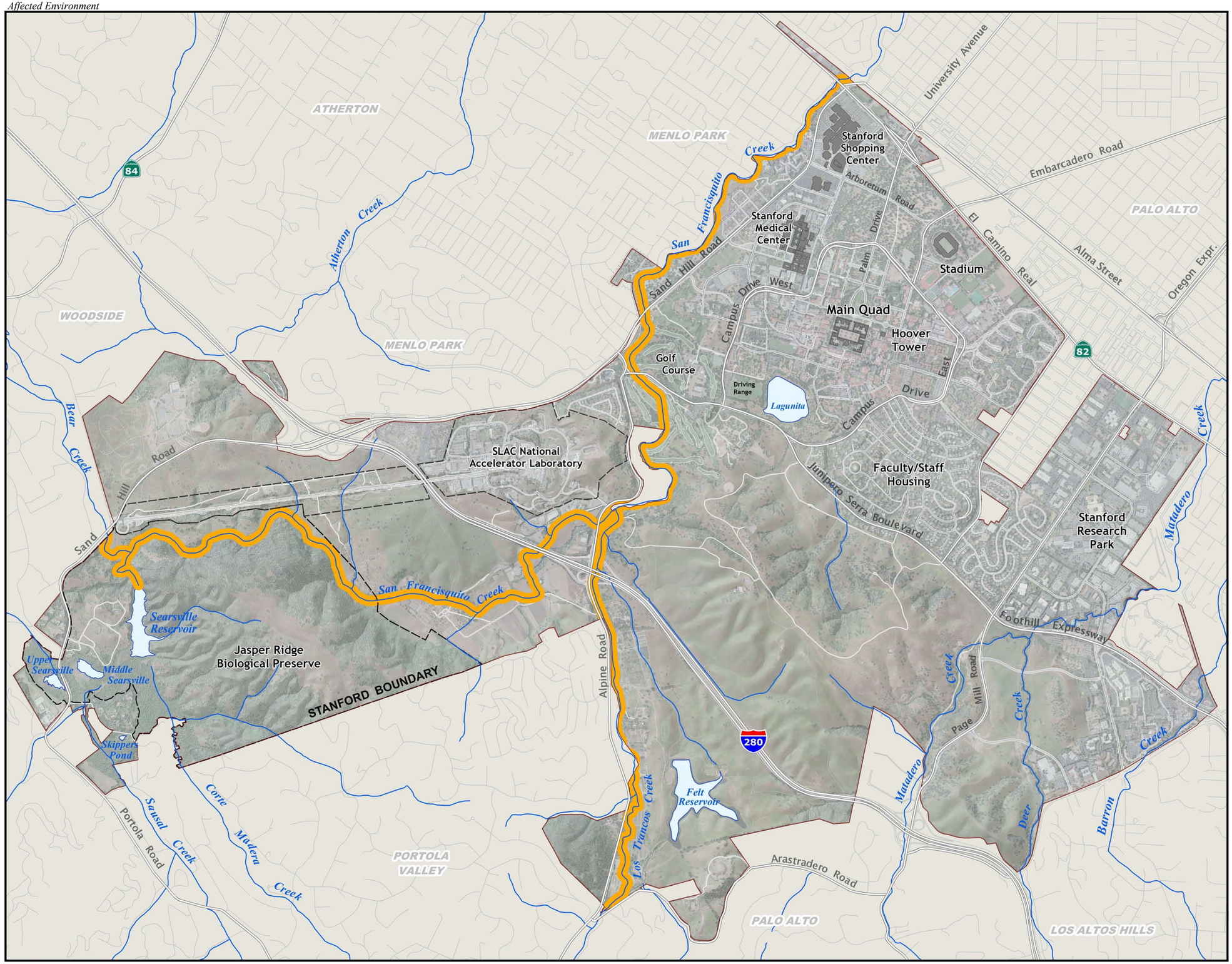
Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-18



Stanford University HCP Environmental Impact Statement

Steelhead at Stanford

Occupied Creek
(Creek width exaggerated)

hectare
100
25
4
acres

Sources:
SH habitat: Stanford Unv. Campus Biologist, 2006
Aerial photos: Aerotopia, 1999
Creeks: US Geological Survey, 1991

Disclaimer:
This map was produced by the SU Planning Office. While generally accurate, this map may not be completely free of error. The information is derived from a variety of sources deemed reliable, but subject to recurrent change and Stanford does not warrant the accuracy and completeness of these data.

Graphic Scale
1 Inch = 0.5 Miles

0 0.25 0.5 0.75 1
Miles

Stanford University Land Use & Env. Planning
Date Printed: March 14, 2007

Figure 4-19